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GENERAL ASPECTS OF INSTRUCTION: LEARNING, TEACHING, AND THE CURRICULUM

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Reviews the literature to January 1942. Earlier literature was reviewed in Vol. IX, No. 3; Vol. VI, No. 3; Vol. III, No. 4.

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FOREWORD

THIS ISSUE OF THE REVIEW represents one of the new areas planned by the Editorial Board in February 1938 and February 1939 when the list of topics for the fourth cycle was reorganized. The issue was designed to cover aspects of education, particularly of instruction, which are general, as contrasted to particular levels, subject fields, or specialized interests. In this sense it has no predecessor, though two of the areas which formerly comprised the issue on "Psychology of Learning, General Methods of Teaching and Supervision" (June 1939, June 1936, and October 1933) are included. The third area of those earlier issues, namely, "Supervision," has now been transferred to the issue on "Teacher Personnel" (June 1940).

A number of new topics have been included in the present issue. Topics which are presented for the first time as chapters are "Philosophy of Education," "Radio and Other Auditory Aids," "Visual Aids," and the "Library." These topics have had scattered and somewhat fragmentary attention in earlier issues, and such treatments will be found by consulting the indexes in the REVIEW.

In accordance with plan, the treatment herein accorded the curriculum and curriculum-making is restricted to general aspects. Work on the curriculum in individual subject fields is presumed to be treated in the several issues of the REVIEW which are devoted to these subject fields.

Other issues of the REVIEW which may be regarded as supplementary to the present issue in treating rather general aspects of education are "Organization and Administration of Education" (October 1940) and "Methods of Research and Appraisal in Education" (December 1939 and December 1942).

DOUGLAS E. SCATES
Chairman of the Editorial Board

CHAPTER I

The Curriculum: A General View

WILLIAM L. CONNOR and RAYMOND WHITE

Historical Perspective on the Curriculum

THIS CHAPTER is devoted to a brief summary of some of the chief phases of research and creative thinking in the general field of curriculum-planning and construction. The more important published studies since 1936 are reported in some detail. Less important studies are summed up in a sentence and others appear in the bibliography without comment. It may be well to review sketchily the curriculum-revision movement—how we came by the curriculum we have, why we are trying to change it, and how we are going about it.

Nearly 2,500 years ago there lived and worked in the city of Athens two overlapping yet opposing groups of philosophers. Chief among them were Socrates and Plato, on the one hand, and Aristotle on the other. Whatever else we may say of the work of the first two men, this, we think, would be generally accepted: Socrates and Plato struggled with the idea of making a choice of what was to be taught to young people in order that they might enjoy the good life and develop the ideal State. On the other hand, Aristotle set up a research organization—the first great educational research organization in the world's history and perhaps the largest that has ever existed in the world—to discover everything to be known about literally everything, to organize it, and finally to write it into textbooks, so that others might, by studying these texts, acquire universal knowledge. For a number of reasons, some too lengthy and others too obscure to report here, the Aristotelian philosophy prevailed; and from his time to our own, education has largely been a process of discovering facts and truth, or what passes for facts and truth, and the organization of this material into textbooks for study in the schools. As scientific and historical research, philosophical thinking, and creative writing have increased in the world, the bulk of the world's knowledge has grown until the textbook has tended to become a compendium of knowledge in its given field, briefly and abstractly stated, and impossible of comprehension except by scholars highly trained in each field.

About the turn of the century there was a revival of the study of Socrates and Plato and the beginning of new philosophies based, in part, upon them and their thinking and, in part, upon the facts of the social situation as they present themselves in the modern world. Perhaps the most prominent philosophy that arose out of this ferment was the philosophy of pragmatism: *That which works is true;* and, in psychology, atomistic behaviorism: *Human learning is simply the conditioning and progressive reconditioning* *of one reflex after another, in detail, until a behavior pattern is formed for the adult.* The revival of the ancient philosophy of Socrates and Plato and the development of pragmatism and behaviorism resulted in a few new textbooks and courses of study presenting elements of choice in terms of personal and social usefulness and detailed analyses of subjectmatter arranged for step-by-step learning of those details which were supposed to be true because they were observed to be useful.

A little more than a decade ago, four new elements were injected into the picture: (a) Philosophers who believed in absolute truth reasserted themselves as realists and began to compete with the pragmatists for control of curriculum-planning. (b) Psychologists began to discover that the physiological basis of behaviorism was untenable—*that the central nervous system acts dynamically as a whole*—and they proceeded to demonstrate experimentally a dynamic theory of learning, characterized by the presentation of interesting or "dynamic" material stimulating immediate, almost automatic, organization of ideas into thought and action, and leading to emotional drives sufficient to bring about the mastery of less interesting or actually inert material. (c) City and state school systems, as well as experimental schools, began to set up organizations to revise the curriculum or to plan wholly new curriculums. (d) Textbook writers began to write new textbooks to carry out the proposals set up in such new curriculums. Needless to say, city and state organizations have been variously led and have adopted strange combinations of all known philosophies and psychologies to guide their work.

Current Criteria for Selection of Subjectmatter

Out of this welter there are beginning to emerge a few principles, partly philosophical and partly psychological, on the basis of which curriculum materials can be chosen: (a) *Social.* Those facts and principles should be chosen for teaching which are most likely to enable the learner to master his environment, or to adjust to it, in the interests of the good life for him and for society. Some persons forget subjectmatter in their enthusiasm for the belief that social goals are to be achieved almost wholly through democratic living in the school. (b) *Psychology of Learning.* Of any two or more facts equally useful, that one should be chosen for the approach to learning which is inherently most interesting or, when properly presented, most "dynamic," that is, most likely to lead to a prompt, almost automatic, organization of ideas into thought and action and an emotional drive to attack less dynamic or even inert related materials. (c) *Testing.* Standards of performance and tests for measuring them are being revised in terms of what pupils of known intelligence can achieve when given better curriculum materials and better teaching. Evaluation of growth along desirable lines by systematic observation is supplementing testing—in some cases, replacing it. Attempts have been made to test "whole growth" resulting from "whole activities"—knowledge, skills, intangibles, and so forth. The new "eight-year" or Aikin experiment tests are examples. (d) *Functional Activities.* Functional activities are treated not as disciplines but as life problems here and now and are useful in training for today and tomorrow. Community resources are much utilized. The ability to think is judged to be the best preparation for life. Facts and skills take relative places in the picture, with ability to think being primary.

One may, however, examine the whole body of published literature on the curriculum and on curriculum-planning without discovering much positive evidence of the clear emergence of these ideas. In fact, the reverse philosophy and practice, or contradictory philosophies and practices, still hold in most quarters. This means that little objective research has been done—primarily, because there is no dominant guiding philosophy. This chapter on the review of research and creative thinking is presented, therefore, as a brief description of a rather confused transitional period from which it is hoped that clearer philosophies and better practices may, in the next decade, emerge.

Recent Philosophical and Analytical Treatises

Dewey (39) clarified his philosophy by explaining the meaning of experience, freedom, activities, discipline, control, and the place of subject-matter in a positive philosophy of education. Contrast and comparison of progressive and traditional practices serve to bring out vividly his philosophy of experience—continuous and interactive—as both the means and end of education. The book is no defense of progressive education but, as a restatement of a fundamental point of view, it may serve to save those who are attempting to work out a forward looking program from some of the pitfalls of the ultraprogressives.

Bode (14) pointed out the inadequacy of the concept of democracy as being that political organization which permits an individual the greatest freedom. Democracy, according to Bode, is a way of living by the group for the good of the group. The section which states the implications of education for democracy as a way of life also presents a point of view for the curriculum worker.

> The school must undertake to exemplify in its organization and procedures, its conception of democratic living.
>
> The primary obligation of a democratic community to its members is to provide for each the opportunity to share in the common life according to interest and capacity. (14:77)

The materials taken from the surrounding environment and the procedures in the school

> . . . are designed with reference both to the discovery and exploitation of individual capacity and to a continuous deepening sense of membership in the social order. (14:83)

> It [the school] must not merely practice democracy but must develop the doctrine so as to make it serviceable as an intellectual basis for the organization of life. (14:94)

Morrison (91) defined the general curriculum as the curriculum of the common schools and estimated the time required to cover it. To Morrison, the curriculum is the sum total of all the common activities of all the people, and all these activities should, sooner or later, find themselves in the schools, regardless of whether that is possible at the present time. Morrison analyzed the common activities which should be in the school. This analysis is presented in terms of subjects to be taught and is distinctly Aristotelian in its outlook, although modern subjects and new phases of all subjects are presented.

Bobbitt (13) made a fresh attempt to analyze society, and the good life in society, as the basis for the curriculum. He carried forward his own and the presentday rebellion against the mediocrity of education conducted through subjectmatter as determined largely by Aristotle, and, since his day, fixed upon the schools.

Beard (96), in the first pronouncement of the Educational Policies Commission, called for educational leadership to reconsider the obligations of education to our democracy. The Founding Fathers considered education the heart of democracy but were prevented by the exigencies of the time from making it so. During the period of Jacksonian democracy, education developed with the growth of the states into state systems with an emphasis on the development of the individual. It has largely followed this pattern until the present time. Let education, says Beard, assume its unique function of preparing youth to live in a democracy.

Hopkins (63) believes the good life is achieved by living it. The curriculum thus becomes those experiences necessary to live the good life in the school. They are to be selected cooperatively by teacher, parent, child, and all others capable of entering into the picture. The individual assumes responsibility for group activity and willingly takes his part in it. Learning, class and school administration, organization of curriculum experiences, and measuring of outcomes are discussed in the light of this basic philosophy of education.

In *Progressive Education at the Crossroads*, Bode (15) stated: "The progressive school cultivates an atmosphere of activity and freedom all its own . . . is a place where children go, not primarily to learn, but to carry on a way of life." (15: 9) Bode identified progressive education with the rise of the common man. He warned that it must cease to be absorbed with the development of the individual pupil and must be guided by a social ideal—the democratic way of life.

> Profitable growth in our day is growth toward a plan for living intelligently in a topsy-turvy world and such growth must have reference to the issue of democracy, which in one form or another, is cropping up everywhere and which is, by all odds, the most important issue confronting us at the present time. (15:85)

He does not wish to depart from teaching the child as a person, but, as he sees it, teaching today lacks social direction and this "participation in a common life is an essential condition for enrichment of experience." Group planning, socialization, projects, and similar innovations point to this essential ideal of a democratic way of living.

> Progressive education has a unique opportunity to become an avowed exponent of a democratic philosophy of life, which is the last remaining hope that the common man will eventually come to his own. (15:122)

The first part of the book by Hopkins and the Committee on Integration of the Society for Curriculum Study (62) gives the evidence for integration in its biological, philosophical, psychological, and psychiatrical aspects, each by a specialist in his respective field. In the light of the principle of the integration of behavior, various types of curriculum organization and practices are evaluated. The traditional subject type of curriculum has least integration; then follow in order the correlated, broad-fields, core, and experience curriculums. While the experience curriculum offers greatest opportunity for integration of experience, and there is a trend in this direction, the author seems disturbed about guidance, because it is, in his opinion, synonymous with education; also he appears to have questions about the practical aspects of administering the experience program.

Lee and Lee (81) wrote to help the elementary teacher develop a curriculum better suited to his children. Proper guidance of child learning requires an understanding of the child as a purposing, growing individual with a personality all his own. The first section of the book discusses the child. The second part of the book gives suggestions for curriculum change in the various areas of experience—social, number, scientific, health, and creative. These suggestions serve as guides to the teacher and at all times give the impression that he is the "director of curriculum" in his own classroom.

Mossman (92) presented a brief account of the history of the "activities" point of view in curriculum development, together with an interpretation of it. She showed that this point of view has been steadily gaining in educational thought and practice since the time of the Renaissance, continuing up to the present day. It is not a fad but a steady growth which has probably not yet reached its peak of maturity.

Rugg and others (113) reported that their survey of the social, economic, and political background of presentday America shows great changes in American democracy. The authors drew up a balance sheet of assets and liabilities to indicate the promise of democracy in America. Democracy and education are interwoven—each dependent on the other. The position of youth in a "depressed" society is not favorable to desired growth. The school has lagged in making adjustments to offer satisfactory educational opportunities. The last two sections are particularly important for curriculum reorganization. The first of these is a discussion of the growth process and the relationship of the growth of the individual to the culture of the race. In the second, the authors discuss "promising efforts" for curriculum reform and indicate directions for progress in the years just ahead.

Rugg (112) described how mass education grew in the Machine Age when frontiers were being rapidly expanded. In the period that followed, education lagged behind progress in other phases of our national life. Thus education, which was designed to perpetuate and give impetus to our national life, was failing in its mission. Rugg does not favor what he calls "administrative tinkering" but a thoroughgoing readjustment of the school's program. In his school, activity holds a prominent place. The illustrations of the new program in health, social studies, and art are indicative.

Schoenchen (120) reported that the activity school is "the result of a slow growth of pedagogical doctrine and practice to which the most diverse types of educational movements have contributed." The author sees the method of the activity school as "heuristic," to which he seems to give the general meaning of helping the child find out for himself as far as possible rather than being told. Pupil activity is formally and systematically applied to teaching procedures. The rather lengthy criticism of Dewey's concept of the activity school seems to be a matter of fine distinctions rather than real differences. The writer relies more on prescription and less on freedom than most progressive educators would favor—"the teacher so manipulates the learning situation that the pupils will choose the activities which the teacher has pre-selected for them to choose."

In *The Changing Curriculum*, Harap and others (97) presented an attempt to get a "glimpse of the distant scene" of curriculum reorganization and to appraise progress on certain programs of curriculum planning in action. The first part of the book is a discussion of the current status of curriculum thinking as regards its basis in the good life and its organization in functional units of experience. The analysis of certain state, county, and city programs of reorganization includes a description of each program with some criticism in the light of the concepts developed in the first chapters of the book. The committee presents a dynamic approach to the problem. There is unity in the basic principles underlying curriculum reorganization, according to these authors, and these principles are well illustrated in the examples of programs in action. At no time is it intimated that we "have arrived," but the challenge to teachers to work on the curriculum is clearly pointed out.

Washburne (136) described the philosophy and practice of education as it is carried out in the Winnetka schools. Throughout the book there is an attempt to justify the Winnetka program. One who has followed the plan in Winnetka for many years can see changes—changes which bring about somewhat more freedom. However, essentially the plan has been, and is, one of prescribed minimum essentials with considerable freedom in some broadening activities. The "essentials" consist of knowledges, skills, or conventions which the child *will* use—not *may* use. The sections of the book which discuss the recognition of the child as a person are valuable for curriculum reorganization. The democratic viewpoint in school administration is well stated and sound. In such a democratic setting curriculum reconstruction could have freedom.

Everett (43) described nine community school programs. Four of these are in urban centers and five are in rural communities. These centers vary in many respects but in each case the community school is the center and an integral part of the community life. The philosophy underlying the program, the organization, activities, and evaluation are given for each program by a person intimately connected with the plan. These programs give many avenues for making the school a community project through combined school-community planning of curriculum, organization, and administration.

Horrall and his co-authors (64) are workers in Lincoln School in San Jose, California. They have made changes in an elementary school to bring about a more vital program. Their experiment is more important because their pupils are not favored either in ability or in social or financial background of parents. They were somewhat below the "garden variety" level. The building was an old one. Teachers were average, except for an interest in doing something about their mediocre program. These facts make the results of experiment more applicable to most schools. Many progressive experiments have been in schools highly favored in teachers, quality of student, materials, and building. The evaluation of the experiment seems sound. Achievement showed more than normal growth as measured by standardized tests. Other evidences, as fondness for the school, creativeness, health habits, secondary-school success, and citizenship abilities, showed excellent progress on the part of the pupils. The book contains complete descriptions of units of work as they were developed in the school.

Spears's book (125) is valuable as a clear presentation of the directions in which curriculum revision seems to be going. After challenging teachers to do something about curriculum development, six types of curriculum plans of organization are clearly described. Overlapping among the types is recognized, but the classification serves as a frame of reference for the discussion of the type programs which follow. The discussion of actual programs in action constitutes the larger part of the book and seeks "to reveal the specific steps certain schools are taking to arrive at the goals promised by the spirit of the movement" (125: 72).

Research on the Curriculum

The studies reported up to this point are philosophical—creative or interpretative thinking—or they are descriptive. Three objective studies are now to be reviewed.

In the *Story of the Eight-Year Study*, Aikin (1) reported the results of the Eight-Year Study under the auspices of the Commission of the Progressive Education Association. The Commission had two purposes in mind in making this study: (a) to establish a relationship between school and college that would permit and encourage reconstruction in the secondary school; and (b) to find, through exploration and experimentation, how the high school in the United States can serve more effectively.

The findings of the study show that the graduates of the thirty schools were not handicapped in their college work, that departures from traditional patterns of prescribed subjects did not lessen the student's readiness for college work, and that the students from the schools which made the most change in the curriculum made the best showing in college. The evaluation was scientifically carried out. It involved careful matching of 1,475 pairs of students and following them through the four years of college work. The "cards were not stacked" in favor of the experimental group. The data which describe the graduates of the thirty schools as contrasted with the graduates of traditional school have much meaning for the curriculum worker.

Two implications come from this study: (a) *Traditional patterns of prescribed courses are not essential.* "The customary relations of school and college are unsound in that emphasis is placed upon out-worn symbols—units, grades, rankings, and diplomas. . . . The conclusion must be drawn, therefore, that the assumptions upon which school and college relations have been based in the past must be abandoned" (1: 118-19). (b) *Secondary schools can be trusted with greater freedom in matters of curriculum than colleges now permit.* "If some in the colleges feared that the Thirty Schools would use their freedom recklessly, they now know that their fears were without foundation" (1: 124).

The counsel given by the thirty schools reflects current thinking on the organization and content of the curriculum. The approach to the whole problem is vital and realistic. To illustrate: "It is only when these paraphernalia (school buildings, classes, textbooks, courses, and credits) of education can be pushed into the background of one's mind that realistic thinking becomes possible. Only then is the teacher able to see the student as a young human being growing up in a very complex and difficult world. And only then can the teacher begin to see clearly and constructively what the school should be and do" (1: 130).

In 1935 Wrightstone published a monograph entitled *Appraisal of Newer Practices in Selected Public Schools.* It attempted to appraise outcomes in certain newer and older types of school programs by "more accurate and reliable measurements than have appeared in articles and addresses by earnest proponents of either newer or older practices." Wrightstone's present study (144) supplements the older one by extending the number of objectives studied by more inclusive descriptions of the practices. Origins and development of experimental programs of education, from the latter part of the eighteenth century to the present time, are described. Instruments for appraising the experimental programs are explained. Six communities in metropolitan areas cooperated in the study—communities representing both the newer and traditional practices. Pupils in the communities were equated by the "matched pairs" technic. Teaching groups were comparable as to such items as salary, experience, training, and pupil load. Data were secured to see how well each type of school is achieving the objectives of elementary education. The results indicate that, if the objectives selected are valid, "the practices in the experimental schools are more conducive to more comprehensive growth than practices in conventional schools" (144: 220). There was a marked growth in the experimental schools in many of the "intangible" abilities, including desirable social relationships, appreciation of worthwhile activities, aptitudes, and critical thinking. In command of common knowledge and skills, the difference favored the experimental schools, though the difference was not statistically significant.

Saylor (117) analyzed the factors associated with participation in modern programs of curriculum development, using as the basis for his study the state of Virginia, where a statewide program of curriculum development, introduction, and use has been in operation progressively since July 1, 1931. His most important conclusion is: "Two factors emerge from all the evidence of the study as being basic to extensive participation by local school systems in a state cooperative curriculum program of the type organized and developed in Virginia—leadership and, relatively speaking, high economic ability to finance schools" (117: 233).

Perhaps the felt need in communities of relatively high economic ability is usually such as to make them reach for higher teaching ability and more dynamic leadership than communities of relatively lower economic ability can envision. A number of studies deserve brief mention because of their bearing on curriculum problems. Rainey and others (106) in *How Fare American Youth?* reported on the problems which youth face today. Bell (10) reported on the economic and social conditions and the attitudes of some thirteen thousand youth in Maryland. Taken together, these two studies are the proper source material for important changes in the curriculum. Dale (36) reviewed various studies of children's questions and pointed out the significance of such questions for the development of curriculum material. Carr (94) reported excellent examples of school practice in education for democracy. Hollingworth (60) presented an enriched curriculum for rapid learners; Connor (31) summed up the story of the education of gifted children, with emphasis on the plan in operation in Allentown, Pennsylvania. Featherstone (44) described the newer type of activities applied to slow learners.

Charters (26) showed how areas of experience are replacing subjects in the reorganization of the curriculum; Caswell (24) emphasized the importance of stressing contemporary problems to be solved cooperatively; and Brooker (16) called attention to the motion picture and the radio as potential educational tools. Oberholtzer (99) evaluated an experiment with an integrated program and showed that the pupils pursuing such a program achieve more than children in the conventional school. Wrightstone (145) proposed criteria for the evaluation of state programs of curriculum reorganization.

Conclusion

The present reviewers believe that the last decade, and perhaps even more the last four years, has been a rather confused, transitional period from which it is to be hoped that a clearer philosophy and better research may, in the next decade, emerge.

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CHAPTER II

Organization of the Curriculum

FRANK A. BUTLER

ORGANIZATION OF INSTRUCTIONAL MATERIALS designates the sequence in which educational experiences unfold during the process of learning. Instructional materials have commonly been organized by subjects within which the chronological and logical sequence determined the order of development. For ages subject lines have characterized the organization of instructional matter. The psychological as opposed to the logical approach has changed the sequence somewhat in many instances, but this change has generally occurred within subject boundaries. Deviations from the logical and rigid organization by subjects and within subjects typify the recent attempts to provide a different and supposedly better kind and sequence of educational experiences.[1]

Opinions differ widely as to the merits of any particular arrangement of materials. Bagley (3) stated: "The Essentialists have always emphasized the prime significance of race-experiences and especially of organized experience of culture—in common parlance, subject-matter." Kilpatrick (16) believes that, "To base a curriculum on a scheme of set subjects is for most children to feed them on husks; the plan here advocated is devised to bring life to our youth and bring it more abundantly."

Broad Fields of Study and Areas of Living

Dillinger (7) stated, in the recent revision of the Missouri curriculum: "The Missouri program is committed to a philosophy of general education at the secondary level. The planning committee believes that it is desirable to organize the general program around certain life problems. It believes, however, that these problems can be developed most effectively within certain large learning areas, rather than in a program which abandons all subject divisions." He then listed the broad learning areas as (a) language arts, (b) social studies, (c) mathematics, (d) health and physical education, (e) nature sciences, (f) practical arts, and (g) fine arts.

Indiana (23) held to the basic subject fields but revised the organization within fields. Social studies materials, for example, are selected and organized to conform to the areas of experience appropriate for study on a particular level: first year, adaptation of individuals to group, home, and school life; third year, understanding life in the broader community; sixth year, understanding the contributions of the Old World to American ways of living; junior high school, group life and problems in the community and state and in the United States; and high school, group life and problems in the Eastern Hemisphere, in the Western Hemisphere, and problems of citizenship in our own country and in other parts of the world.

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[1] Various forms of administrative organization to aid in adapting school experiences to pupil needs were discussed in "Organization and Administration of Education," *Review of Educational Research* 10: 315-23; October 1940.

Characteristic of several state and community revisions is the determination of areas of human activity. The Mississippi Program for the Improvement of Instruction (19) has nine areas: (a) "Protecting Life and Health," (b) "Making a Home," (c) "Conserving and Improving Material Conditions," (d) "Cooperating in Social and Civic Action," (e) "Getting a Living," (f) "Securing an Education," (g) "Expressing Religious Impulses," (h) "Expressing Esthetic Impulses," and (i) "Engaging in Recreation." These nine were selected after a study of thirty-eight classifications as derived by research investigations, students of society, and educational leaders. The nine areas serve as a basis for defining the general scope of the core curriculum and the centers of interest or emphasis. Similar areas of human activity characterize a number of other state curriculums, for example, Virginia, Missouri, and Indiana.

Jacobson (12) wrote that the faculty of the University of Chicago High School "feels that a vital reorganization of general education within the framework of the present subject matter departments can be achieved . . . it would include correlation as a method of teaching whenever or wherever it has meaning." Frederick (10) made an examination of books, research investigations, courses of study, and articles relating to research in curriculum construction, 180 of which were carefully selected and studied. He found that during the last two decades the combining of separate subjects into broad fields, such as science, mathematics, social studies, and language arts, and the correlating of work in different subject fields were two of the trends frequently mentioned. Broad subject field organization in general education rather than separate subject organization within a field is reflected clearly in the studies of the Commission on the Secondary School Curriculum (24). The needs of youth should determine the source and the organization within the broad fields.

Organization in Terms of the Problems of Youth

Organization of learning experiences that disregard subject lines is probably the most recent innovation. Aikin (1), reporting on the Eight-Year Study of the Progressive Education Association, described the endeavors of a group of thirty secondary schools to organize experiences on a different basis in general education or the core curriculum of the thirty experimental high schools and the effect of this training upon later success in college. "Almost all the schools were trying from the beginning of the Study to find ways of breaking down the artificial barriers which unfortunately separated teacher from teacher, subject from subject." Schools most experimental in nature deviated most widely from the attempt to "put subjects together." Stress was "upon the problems which young people face while they are still *young* people, upon the concerns of high-school students while they are still in high school." This stress was upon "problems" and "concerns," with disregard to subjects as such. Aikin reported that "1,475 pairs of students were studied—those entering college in 1936, for four years; those entering in 1937, for three years; those entering in 1938, for two years; and the class entering in 1939, for one year." A pair consisted of one student from one of the thirty experimental schools and one student who entered college in the traditional college preparatory manner. Several conclusions are: "It is quite obvious from these data that the Thirty Schools graduates, as a group, have done a somewhat better job than the comparison group whether success is judged by college standards, by the students' contemporaries, or by the individual students. The graduates of the most experimental schools were strikingly more successful than their matchees . . . students from the participating schools which made most fundamental curriculum revision achieved in college distinctly higher standing than that of students of equal ability with whom they were compared . . . the assumption that preparation for the liberal arts college depends upon the study of certain prescribed subjects in the secondary school is no longer tenable."

Unit Plan of Organization

A decade ago Billett (5) found that unit organization of materials was one of the three general ways of providing for individual differences in secondary schools. Today's educational literature on the unit is astoundingly voluminous both in the discussion and production of units. The Morrison concept (20) of unit organization has expanded to mean "all things to all men." Whatever the external framework of recent organization may be, the internal arrangement is generally in terms of units. Unit organization is actually inherent in any arrangement wherein terminology includes topics, problems, or projects. A unit encompasses logical or psychological approaches. From blocking a subject off into logical and unitary divisions all the way to treatment of areas of experience of vital concern to youth, the unit has stretched and held its name intact.

Frederick (10) found there was a "trend for the core curriculum to be organized into units of experience based on significant situations, phases of life, interests and needs of pupils, or problems which pupils now face or will face in the future." Mackenzie (18) reported that secondary schools in California which had made significant progress in reorganization of their programs in the core curriculum used the unit organization within subjects or in problems of life or areas of experience.

Activity Programs and Organization

While no standardized sequence of school experiences holds in activity programs, there is the tendency for these programs to deviate little or much from the customary subject treatment. Dissociated from the pure activity in learning, the programs include topics, imaginary trips, projects, problems, units, and other ways of organizing experiences in terms of pupils' needs, interests, and abilities.

Jersild and others (13) reported on one of the early evaluations of the large-scale experiment with the activity program in the elementary schools in New York City. They defined activity education as a "program based upon units of pupil activity as a substitute for and supplement to the traditional textbook learning." This experiment was started in 1935 in seventy elementary schools and continued for a period of six years. The report is based upon evaluation of eight control and eight activity schools comprising Grades IV, V, and VI. Early testing indicated that "activity classes consistently surpass control classes in quality of cooperative, critical, experimental, leadership, and self-initiated activities; children in the activity classes lag appreciably behind children in the control classes in some of the educational outcomes which are measured by an achievement test of academic skills, mainly arithmetic and spelling." Morrison (21) also reported on a follow-up survey of the New York City Activity Program made by the state education department by request from the New York City Board of Education. A fuller statement appears in the chapter on "Activity Education," which follows. The Progressive Education Association committee to report on evaluation of newer practices in education (25) found that "where schools have adopted newer educational practices the children learn as much of the ordinary school subjects as they would otherwise have learned. Sometimes they learn slightly less and sometimes slightly more, but the differences are small. . . . Where any measures have been applied, there is a definite gain in terms of initiative, skill in dealing with problems, knowledge of contemporary and world affairs, and social participation."

Organization of Courses of Study in Three Fields

Bruner (6) had access to eighty-five thousand courses of study on file in the Curricular Laboratory and Library of Teachers College, Columbia University. His study, which covered a period of five years, was limited to an analysis of the outstanding courses in social studies, science, and industrial arts from 1930 to 1940. His findings were as follows:

Science—Emphasis on the logical development of subjectmatter, with its resulting narrowing effect on scope, was most noticeable in the specialized sciences, namely, physics, chemistry, and biology. All the courses in general science, with the exception of one, tended to emphasize functional values, with a resulting greater attention to social applications than to predetermined sequences.

Social studies—Eight types of social studies organizations were found: (a) separate subjectmatter organization (overwhelming majority of the 5,029 courses fell in this category); (b) correlation between and among different social studies areas; (c) correlation with other subjectmatter areas; (d) modern problems organization; (e) broad-fields organization; (f) core curriculum organization; (g) guided experience organization (teacher guidance); and (h) pupil experience organization (growth of pupils through experiences in which they are keenly interested).

Industrial arts—The internal organization was of three types: (a) formal arrangement or combination of skills, processes, or knowledges; (b) sequential projects prearranged; and (c) project differentiated to meet individual needs.

Organization for Academic and Nonacademic Pupils

The Research Division of the National Education Association (22) received questionnaires from 1,062 secondary-school principals who expressed their opinions pertaining to provisions that should be made for superior students. A large proportion believed that superior students, whether in separate or regular classes, should be given especially enriched programs of work; the material should not be merely more of the kind given to average students but mainly the kind that will deepen and strengthen their understanding of the world and which will stimulate their superior powers of reasoning and invention. Opinions about ability grouping were evenly divided.

In their study of provisions for the educationally neglected (nonacademic, slow-learning) pupils, the National Association of Secondary-School Principals (8) advocated the development of modified courses and differentiated programs for the college preparatory, commercial, and educationally neglected pupils. Attempts to "dilute" the conventional subjects to suit individual differences have proved unsatisfactory.

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CHAPTER III

Activity Education

KATHARINE B. GREENE

Spread of Philosophy of Activity Education

ACTIVITY EDUCATION has spread rapidly during the last several years, as findings from the fields of psychiatry, psychology, and education have permeated the ranks of educators. The objective of education is now often seen as the development in individuals of a spirit of independence in solving the problems of life, through experiential understanding of the behavior and motives of themselves, their fellows, and the community; the development of rules in the attack on these problems; and the cultivation of attitudes for the confident approach to these problems. Locke's theory of the *tabula rasa* is at last being supplanted by the theory that the child is an active, reactive individuality, unique in himself—a theory which in American education can be traced primarily to the teaching and philosophy developed by John Dewey.

This change in educational principles has not been adopted wholesale; in its very nature it cannot be imposed from without. It has seeped through our educational program, appearing in many different places in established systems, as individual educators have become convinced of its validity. Usually it has come into conflict with dominant patterns of authoritarian discipline and frequently it has been the source of emotional conflict between its adherents and those who believe in the establishment of rule, authority, and discipline for the sake of discipline.

With its emphasis on the value of individual thinking and adaptation to the actual situation of each problem, the philosophy underlying activity education appears in as many different guises as there are situations and workers. It is therefore impossible to summarize the work done in rules which are universally applicable. Only the philosophy is general, while each educational application differs from every other application. No one stated application can be called the only true activity education. If educational practice becomes crystallized, we shall no longer have true activity education.

Since the Deweyian philosophy has seeped through to education from various points, there are many different levels of progress in its educational application. Some learning situations have just begun to respond to its influence, some are well enough along so that descriptions of them are available, and few of them have reached the level at which it is possible to compare results through analysis and research technics.

Working Concept of Activity Education

Since activity education appears in many different guises and on different levels, the following definition of limits has been used to determine what falls in this field. It is activity education when the teacher and children who are in the learning situation do the planning of the curriculum, select the methods to be used, and appraise the results, while all the administrative, research, and special resources of the school and community are called upon for help, but do not interfere by determining from outside exactly what is to be taught and how. In activity education, the center of thinking about educational problems and their solution is within the group, all other individuals and groups being secondary, revolving around the center. Better forms of activity education consider the community and appraise results realistically in terms of community value, but are not coerced nor hampered arbitrarily by conclusions of outsiders.

A rough rule of thumb for measuring quality of education in the group is to measure growth and change in the teacher, for no matter how much the group may ape forms of activity education it is not real if the teacher comes out at the same point at which he entered. There is much sporadic activity education carried on in standard schools, within limitations imposed by the requirements of the system and the community: good teachers under any system have believed that each child was an individual and have stimulated him to draw conclusions from his own experiences. A real loss to educational advance has been that often the teacher is not encouraged to continue his growth and that of the children, but is hampered by criticism and pre-formed judgments.

Treatises and Reports on Activity Education

Recent authors dealing with activity education in general are De Lima (13), Heffernan (34), Leonard and Eurich (25), Lane (24), Melvin (30), and Washburne (35). These volumes give good descriptions of practice in individualized activity schools, with general explanations of underlying theories. It is possible from these summaries to compare technics and results on a subjective basis. There are more limited reports which give practical advice in showing how activity education is carried on, as in *Educational Method* (14), Heise (17), and the San Diego monograph (41). In New York City, the Speyer School did early experimental work with the activity program. The conclusion of Pritchard and others (39) based on the work with slow learners was that there was no noticeable improvement in ability of slow learners through the methods used then. An article by Burton (11) gives a general summary of current educational attitudes toward activity education, and Baker (40) summarized activity education for the lay reader.

The New York City Experiment

This is the largest experiment in elementary activity education which has been carried on and evaluated by accepted research procedures. It has been reported in numerous articles (18, 20, 21, 22, 28, 29, 31, 42, 47, 49). The final statements made by the research workers carry weight. Jersild, Thorndike, and Goldman concluded (21: 308):

> While the control children seem to have a slight but statistically unreliable advantage as far as achievement in academic subjectmatter is concerned, the activity children surpass the controls in the frequency with which they exercise such presumably wholesome activities as leadership, experimentation, self-initiated enterprises, participation in oral discussion and the like. The activity children have more experiences and show more tangible accomplishments in the fields of the arts and crafts. The activity children, as already noted, also tend to be superior in tests that call for intellectual operations such as those involved in the Wrightstone tests of working skills, explaining facts, applying generalizations, current events, what you believe, and personality reported in the main body of the present study.

Morrison's survey (31) gives statistical tables for comparison of results in activity and nonactivity schools for mastery of skills and knowledge in the sixth school year; educational growth in fourth, fifth, and sixth school years; attitudes and behavior of the children; teachers and the activity program; and parents and the activity program. In the summary (p. 162) it is stated that:

> In the mastery of knowledge and skills, three conclusions are supported by the data reviewed . . . : (1) the only statistically reliable differences between the two programs favor the activity procedure and are found in those areas affected by the latter's emphasis upon developing skill in critical reading, in the use of elementary research techniques and in the development of civic attitudes and understanding of social relationships; (2) in all but three of those areas of knowledge and skills wherein the differences found favored the regular program, improving the sampling of the activity program tended to lessen or to eliminate the difference; (3) the activity program may be continued and improved with reasonable assurance that children will gain as thorough a mastery of knowledge and skills as they would in the regular program.

One of the standard complaints about activity education by casual observers is that it is disorderly and children are not learning to respect authority. Morrison (31: 163) stated:

> The fear that the activity program might tend to cultivate a certain lack of respect for authority seems to rest solely on observed behavior of children in the early stages of transition from outward control by the teacher to inner self-control. In respect for school authority the activity children tend to excel. If the activity program has fostered less respect for the authority of the home the parents have not discovered it.

With regard to the development of such attitudes as could be measured at present, Morrison reported (p. 162f):

> In the appraisal of the school's influence upon the attitudes and behavior of pupils outside the classroom, certain conclusions are evident: (1) pupils in the

activity schools like school better, find it more interesting, and tend more to carry its influence into their life outside the school; (2) pupils in the activity schools tend to excel and in some cases by reliable differences in such qualities as cooperativeness or working together, self-confidence or poise, lack of subservience, creative abilities, self-discipline and scientific outlook; (3) in developing respect for the authority of home and school, the two programs are almost evenly matched in the outcomes.

There is no attitude that the problem is solved and can be pigeonholed. Morrison (p. 164) said: "Much attention needs to be given to improving the activity procedure even in those schools that have been committed to its development. . . . Before they undertake its practice, teachers and principals need to give careful consideration to the theory of the activity program; yet a thorough understanding of its objectives is possible only through practice in trying to attain them in the school's work. . . . Teachers need expert assistance in obtaining mastery of the methods and techniques of the activity procedure."

Experiments on the Secondary and College Levels

Activity education has been described by a class which went through Ohio State University High School (36). The students reported (p. 296):

> We have never had the feeling of having education handed to us already to be absorbed, but have been stimulated to the desire to learn, discover things in our own way, and think for ourselves . . . because it will be necessary for us to be a part of a democratic order, our teachers feel and have made us feel that we should begin to think and do for ourselves while we are young (p. 298). Because of the fact that we do not have a required amount of work, it would be possible for us to continue most problems indefinitely. This makes us feel that we could always go further and that our work is never finished. . . . Discipline has never been a very grave problem in our school, and we, as students, have never been very conscious of it. There is not a long list of hard-and-fast rules, but individual problems are taken care of as they arise.

The work of the Progressive Education Association in the Eight-Year Study (1) is the most extensive in the secondary-school field, involving thirty schools whose application of the principles of activity education ranged from slight variations of standard forms of education to radical innovations. Since college entrance is a recognized goal of high school, the experiment could not begin until some three hundred colleges agreed to accept graduates of cooperating schools on more flexible terms than are usual. Now the Association hopes that other secondary schools will be granted this same freedom to develop curriculums in keeping with the needs of students and the community. The Association proposes that, until colleges organize their own purposes and know what candidates should present to fit them for college, restrictions on high schools be lifted; that what is needed for college preparation should be worked out by high schools and colleges cooperatively; and that needed information about students should be presented to colleges by high schools through some means other than issuing certificates that certain courses have been taken.

The thirty schools say this about curriculums (p. 138): "First, every student should achieve competence in the essential skills of communication . . . and in the use of quantitative concepts and symbols. Second, inert subjectmatter should give way to content that is alive and pertinent to the problems of youth and modern civilization. Third, the common, recurring concerns of American youth should give content and form to the curriculum. Fourth, the life and work of the school should contribute, in every possible way, to the physical, mental, and emotional health of every student. Fifth, the curriculum in its every part should have one clear, major purpose."

Dean Hawkes reported on the college success of students from the experimental secondary schools (1: 149 f): "On the whole, the students from the Thirty Schools were superior to the control group. . . . So far as these data are significant, the students from the schools whose pattern of program differed most from the conventional were very distinctly superior to those from the more conventional type of school."

Lack of Appropriate Research Technics

The greatest amount of reported material on activity education is on the descriptive level. Here the work is still tentative and subjective judgments are necessarily used in appraising results. Research in many cases is hampered by several restrictions. There are too few students studied and far too short a time to justify statistical analysis; also there are too few research tools for the study of planned purposes of activity education. The lag in development of research tools means that while we are able to test adequately acquisition of knowledge (which is the goal of authoritarian education) comparing children's achievement in school A with that of children of equivalent ability in school B, in arithmetic, spelling, or reading, we cannot so readily compare the extent to which children have reached goals stressed by proponents of activity education. There are too few tools developed for measuring social adjustment, leadership, cooperation, intellectual interest, scrutiny of a situation for its true values, liking and understanding of individuals with different patterns of living, willingness to see and attempt to solve problems in living, and knowledge of when to use tools, according to one's ability and control of them.

It is a slow process to construct and evaluate tests in this new field. There have been several starts which are suggestive for later work. Anderson (3), Bavelas and Lewin (5), Brewer and Anderson (9), Heise (17), Jersild (19; 22, Part 2), Lane (24), and Lippitt (27) offer materials which may be worked up into objective measurement of the teacher's influence in educational situations. Anderson (3) Barker (4), Bingham (8), Finley (15), Heise (17), Jones (23), Lewin and others (26), Morrison (31) Murphy (33), and Wrightstone (49) give examples of various methods of measuring results which are stressed more by activity than by nonactivity education. The development of research tools other than academic and intelligence tests, to measure contributions to growth of children by activity education, is a very necessary next step before further evaluation will offer us much new light on the comparisons of activity and nonactivity (or standard) educational procedures.

The Teacher and the Environment in Activity Education

While the teacher may be the most potent single force in the child's education, he is not the only one. There is a strong trend in activity education to recognize this fact. Teachers who wish to understand effects of the out-of-school environment on their children will find the work of Skodak (43) stimulating although later work does not confirm all the data. The influence of evacuation from danger areas was discussed briefly at a meeting of the British Psychological Society (10). The influence of Gestalt psychology on the study of social relations has great significance for activity education. Children's responses to democratic and authoritarian group atmosphere, described by Lippitt (27), showed marked differences in favor of democratic procedure in producing good social behavior in the children, efficiency in production, and continuing interest. Authoritarian procedure, however, was not a duplicate of the situation in the world in general, since the children did not feel that the sanctity of tradition was on the side of authority and did not feel that sense of service to an ideal which the authoritarian movement has sometimes successfully invoked.

Lewin, Lippitt, and White (26) have studied aggression under differing social conditions. An article by Zachry (50) considered effects of psychiatric interest on education, while a more theoretical article by Frank (16) clarified the impact of the social milieu on individual growth. Prescott's book (38) is source material needed by every activity teacher for understanding his function. While much psychiatric technic is not available for the layman, the educational process itself may be used for promotion of good mental health. Articles by Finley (15) on class structure, Bender (7) on group activities, and Curran (12) on art, all point out methods of utilizing educational facilities for analysis and improvement of mental health. The meeting of the British Psychological Society (10) represents a study of children's problems in wartime, the recognition of which will alter the attitude of teachers toward children in peacetime education.

Many standard elementary schools have gradually adopted activity procedures from successful methods used by nursery schools. Since authoritarian pressure to cover ground and impart information has not weighed so heavily on early elementary years, it has been easier to introduce new methods without censure. Centers for the study of preschool children have sent out trained workers whose influence on educational practice has been marked.

Learning Is Many-Sided Development

Three generations ago, in the United States, education beyond the first three or four grades was largely considered as professional preparation. Sixty years ago it was not possible to obtain a free secondary-school education in Brooklyn. When formal schooling was so limited in purpose, the majority of our population got their real education outside school. Now our free schooling has been extended to care for all educable persons well into the teens, but there is still a division between what the majority need and what schools offer. The idea that we are concerned with more than intellectual processes can be traced to the work of G. Stanley Hall. The "whole child" is a phrase which denotes at least lip service to this concept. Another analysis of children's problems in education was summarized by Olson and Hughes (37) as "Organismic Age." Olson's results showed that the learning rate is affected by several factors besides the commonly accepted one of ability. Jones, Conrad, and Murphy (23, 25) traced the relationship between development in emotional and social fields and learning. For all those who wish to follow developments in this field, the work of Murphy (32, 36) is an excellent guide. Strang (46, 48) offered a guide for teachers who wish to apply available technics to the study of children whom they are helping, while Jersild (19, 20) presented a picture of the teacher as a "whole teacher" (as children see him) and Brewer (9) presented tools which may be of use to the teacher in measuring his own effect on children. Bell (6) outlined some considerations of the nature of children and the learning process which teachers should know, and Stoddard (45, 47) drew conclusions as to relations between findings in child psychology and educational theory from his experiences in both fields. Research in development during early ages is exemplified by Anderson (3), Barker (4), Murphy (33), and Updegraff (48).

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CHAPTER IV

Philosophy of Education

FREDERICK S. BREED

Decline of Opposition to Philosophy

One would have to be afflicted with a species of mental blindness who has failed to observe, during the past generation, that the reputation of philosophy among educators has been clouded with suspicion. Indeed, education as a field of study is not alone in this respect. In numerous areas where scholars ply their craft, the feeling has spread that philosophy represents a futile approach to the solution of the problems of the world. The "speculations" of the metaphysician have been unfavorably contrasted with the verifications of the scientist, and students in considerable number have turned their backs on philosophy, preferring to accept the faith of leaders who grew up in the same tradition as themselves and as unencumbered with a knowledge of the subject. For better or for worse, however, the resistance to philosophy is perceptibly weakening. The barriers to philosophic study are being swept aside. Evidence that a change of attitude is taking place can be found in the organization of the Philosophy of Education Society in 1941; the publication of the Forty-First Yearbook of the National Society for the Study of Education, Part I (3, 6, 11, 14, 15); and the decision of the editor of the Review to admit a chapter on this subject.

Prior to these events a situation developed that had a more deterring effect on the opposition than any of them. This was the unmistakable demand for improvement of the instructional approach in the classrooms of the country, reflected in the progressive movement, and the fact that the principal inspiration for this demand had its origin in philosophy. It shortly dawned on intelligent observers that the experimentalism upon which the new movement was based had a broader foundation than the experimentalism of educational science as currently pursued, that the reform under way could not be properly appraised until it was understood, and that it could not be understood without a degree of competence in philosophy. Thus seems to be explained the recent rejuvenation of philosophy as an educational discipline, a discipline that in no way impugns the findings of science but, on the contrary, takes them wholeheartedly unto its bosom.

Numerous Philosophies of Education

Before entering into a discussion of the broader foundation for educational thought provided by philosophy, it seems proper to devote a moment's consideration to the title of the present chapter. One may champion the value of philosophic reflection, and indeed have a cherished philosophic outlook of his own, but still lack the presumption to offer this outlook as the only hope of salvation for educators. The possessor of the outlook may believe nothing less, but others will easily be found who believe something else. Accordingly, no trace of dogmatism lurks in the title for the chapter; the caption is intended only to suggest a deep felt need for a clarification of the basic ends of democratic education. It implies a latent confidence that by giving thought to this problem, with all the resources of knowledge available, the major purposes to be achieved in the schools can be brought into clearer light so that energies now scattered may be focused for their realization.

For years Dewey was so exclusively prominent as an educational philosopher that it was natural for many to conclude that the only philosophy of education they knew was the only philosophy there was. But even then Dewey made no claim that his instrumental pragmatism was more than *a* philosophy of education. Today educators are in a better position than ever before to appreciate the meaning of this fact, thanks to such timely publications as Brubacher's recent volume (7) and the 1942 Yearbook of the National Society referred to previously.

The pattern of a sound educational philosophy is logically inseparable from one's philosophy of life, and the latter may take any one of several fundamental forms or combinations thereof. These forms are quite familiar in the annals of philosophy and go under the names of idealism, realism, instrumentalism, scholasticism, and the like. The differences that obtain among these viewpoints stem mainly from different conclusions about the nature of the knowledge process.[1] Since this process, known otherwise as the thought process or the process of reflection, is central in education, it is clear enough that the same differences in theory of knowledge will also mark off the leading points of view in general educational theory.

Possibility of Greater Agreement

It is significant that while all the contributors to the recent National Society yearbook on the philosophies of education agree that respect for personality, for individuality, is the primary educational principle in a democratic state, they diverge considerably on the nature of religion and its relation to education, on the nature and function of discipline, on the notion of truth and its degree of authority, on creativity in experience and education, on the instructional approach to be employed in the schools, and, lastly, on that extremely crucial topic, the nature of value, general as well as educational.

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[1] The writer has discussed the points of difference between instrumentalism and realism in the yearbook referred to, p. 87-138. This is a family quarrel which is forgotten by these empiricists whenever absolutism, their common enemy, appears.

It is apparent that the present situation in the field of educational philosophy calls for a high degree of tolerance and patient comparison of views. It is surprising that Brubacher (6) did not find more points of resemblance among the different educational philosophies which he examined. As discussion proceeds, however, it is not too optimistic to expect that points of difference that spring, as many do, from lack of information, misinterpretation of fact, inconsistency of thought, and the miscomprehension of opponents will tend to disappear. If so, areas of agreement should be enlarged as the various outlooks are more fully explored.

Persistence of Fundamental Differences

Exploration has already gone far enough to show, however, that the leading outlooks on the world and education are each founded on relatively few fundamental propositions known as assumptions or presuppositions. Such propositions are neither God-given revelations nor absolute truths achieved by human intelligence, say the empiricists; they are but generalizations from experience—hypotheses, if you will, supported by belief. It is not difficult to see how such fundamental principles operate in the lives of those who take them seriously. They naturally give rise to different ways of looking at life and education. The devotee of the Absolute lives in a world serenely guaranteed, where all is well from everlasting to everlasting, even if he occasionally leans back in his easy chair, lights up a cigar, and takes a moral holiday. By the same token the pantheism of Mary Baker G. Eddy excludes the reality of evil and explains the familiar attitude of the faithful toward error and disease. Similarly, the scientific determinist has no room for ethics in the sphere of human relationships, for it consistently disappears in a mechanical world controlled throughout by natural causation, as he defines it. In contrast, many realists and pragmatists have achieved a deserved reputation for being tough- rather than tender-minded because they are consistently prepared to face the tribulations of the universe with no greater revelation than natural knowledge, no better guide to conduct than human intelligence, no more certain guarantee of salvation than human effort. For this variance philosophers are disparaged in certain quarters, even though physical scientists in the same manner and for the same reason hold different hypotheses regarding the nature of light, biologists are divided on the causation and extent of heredity, and psychologists are at odds concerning behaviorism, the proposals of the Gestaltists, and the nature of consciousness itself.

Democracy Must Decide

The moral of these examples is not far to seek. They suggest clearly enough that the facts in our possession are not everywhere susceptible of an unequivocal interpretation. Important controversial issues still divide the ranks of scholars in all fields, and with the differences in concepts are correlated differences in practice. Where an issue is thus in doubt, a democracy can either allow competing views to flourish unmolested in the spirit of an easy tolerance or by majority vote select and reject as seems most beneficial for the interest of society. It is a mistaken notion to believe that education should proceed according to the doctrine of *laissez faire* while economic and political interests are being subjected to control. Education functions as a part of the general social fabric. The national system of education should be analyzed with a view to determining the major ends to be achieved, and these ends, with popular approval, should become the distant goals of instruction in the schools, subject always to modification dictated by experience, including, of course, the results of research. Unanimous support for an objective is no more necessary in education than it is in politics. In either case, the opinion of the majority should prevail. The important democratic consideration is the open door to truth, the essence of a true progressivism.

At this juncture the reader may be disposed to scratch his puzzled head and opine that the immediately foregoing statement has a peculiarly familiar ring. "I have it," he may finally affirm, as a faithful memory harks back to the scholasticism of Mortimer Adler echoing through the racy ironical pages of *The Higher Learning in America* (12). It is true that we are anticipating a more definitive, a more positive, organization of public education, just as Hutchins is striving for a similar reform in higher education, but with a distinction in methods of approach that marks a tremendous difference.

The Decision of the Modern Scholastics

The framework of the Hutchins reform rests on the philosophy of St. Thomas Aquinas. More broadly, it is built on the philosophy of absolutism. Adler acts as a modern exponent and interpreter of this philosophy. Hutchins concerns himself largely with the educational applications. The product of their endeavors has received acclaim from the high priests of Roman Catholicism because Thomism figures so prominently in the official philosophy of the Catholic church (15). The program of reform has been scorned by empiricists as medievalism because it is a reversion to scholasticism. It is also a reversion to Aristotelianism through St. Thomas Aquinas.

In the Hutchins proposals empirical thinkers, including the scientific group in education, can find much to approve. Emphasis on the interest approach, on the historic contributions of human intelligence, on the integration of college departments, and even on the warmly debated 6-4-4 plan need not be occasion for alarm to empiricists, or so it seems to the writer. But many of the most progressive adherents of this philosophy stand adamant against the metaphysical core curriculum proposed for adoption at the University of Chicago.

Empiricism versus Absolutism

The frustration of the reformers on the home front is a direct result of a serious clash between two fundamental philosophies of life. Adler and Hutchins make a sharp distinction between philosophy and science; their empirical opponents make no such distinction. With the former, philosophy provides a technic for laying hold of absolute truths, with the latter, the principle of induction is still the foundation of all knowledge, and the relativity of truth its natural and accepted consequence. According to the empirical doctrine, philosophy is but a venture in the direction of greater generality of thought. The "clear and distinct ideas" that pass with the absolutists as revelations of the cogitation of Almighty God are regarded by the empirical group as impressive examples of self-deception and misinterpretation. The latter group are yet to be convinced that there are any self-evident truths in the sphere of term-thing relationships, which includes the basic knowledge of science. This is not to say that basic relationships discovered by experiment and expressed in mathematical form may not be used by an Einstein for the discovery of relationships hitherto unknown. This technic is a commonplace with mathematicians. But the conclusions reached can never be more secure than the facts assumed as a basis for the proof, and these are characterized by their relativity, which means that they are subject to revision as research proceeds.

Some of the obscurity that hangs over this theoretic struggle like a fog can be dissipated if the crux of the problem is more definitely identified. To the writer the fundamental issue arises from different conceptions of the nature of value. This statement of the problem covers not only the value of truth but value in general. Adler charges that the present-day empiricists ("positivists" to him) have brought modern culture to the brink of ruin through their impotent skepticism. He is irked by their insistence on applying scientific rules of evidence to his proposals for their redemption, when the fundamental values of human experience, according to him, are not empirically established. These values include the ends, objectives, or goals of education, hence the general alarm in educational circles.

An Empirical Theory of Value

The empirical conception of the determination of value can be briefly described, even if it cannot be adequately discussed, within the narrow confines of our allotment of space. To avoid ambiguity it should be observed that the term "value" is commonly applied to that which is valued as well as to that which confers the status of value. Let us abstract, for the moment, from the question of determining *what* objects or, more broadly, experiences are valuable, and note, if we can, *how* their value is achieved. In what, the question is, does their value reside?

Let us hark back for a moment to the value of truth. A truth is a belief, say the empiricists, that has been verified by experience; but the verification is not the evaluation, else the professor who bases his profession on useless knowledge, without professing to do so, would never have won his present unenviable distinction in comedy and the comic strip.

Value as known this side of heaven is a product of human reaction. Nothing, as far as known, seems to have value in itself. The attitude of man to an object or event determines its value. Value, that is, is attached to an object by virtue of a type of external relation to humans. Fundamentally, a thing is said to have value if it is attractive to humans; and that is attractive which attracts. Some empiricists express this basic notion in terms of interest (17); others employ such terms as preference or desire or demand, but no divergence of view worthy of note is reflected in the phraseology. Pursued somewhat further, the roots of value are found hidden away in the reactions of selection and rejection, in the positive and negative responses of the organism to the elements of its environment. It is appropriate, therefore, to speak of positive and negative value. For citizens of the United States democracy possesses the first; totalitarianism, the second.

The Failure of Infallibility

In the educational controversy with which we are concerned, it now becomes important to devote attention to the things that are valued. Under this category belong the fundamental objectives of education. In the choice of ends one may rely on the purportedly infallible reason of an Absolutist, on a conception of reasoning borrowed from the ancients, or one may proceed in terms of the conclusions of modern psychological science regarding the nature of the reasoning process in man. The modern scholastics, however, show little interest in the James-Dewey tradition in scientific psychology, preferring exegetical studies of Aristotle, Aquinas, and St. Augustine to illuminate their pathway. Challenged to produce infallible selections of educational ends, "evident or self-evident truths that can be affirmed without demonstration," they have illustrated their mode of procedure in a series of syllogisms which leaves one as much in doubt as the classic "proofs" of the existence of God. It will be interesting, if not astonishing, to note that their quest for certainty is pursued with undiminished confidence, even though the "proof" at various points rests "upon certain evident truths known by intellectual observation of existing facts." It is not surprising, therefore, that Adler terminates his effort with the admission that "no adequate demonstrations have been completed" (1).

Scientific Determination of Value

The empirical school of thinkers finds the value problem in the field of existing facts. Humans are observed to assume a specific relation to objects, known as the value relation. The situation can be symbolized in the expression *A r B* in which *A* and *B* signify the terms related and *r* represents the relation. All three elements in the situation are regarded as objective—discoverable existents in the external world. Hence, say the scientists, value is a legitimate subject for objective investigation. The difficulties of research in the field are practical, not theoretical. The problem becomes one of identifying the fundamental interests of humans. The uncertainty of scientific truth is no sufficient warrant for deserting the scientific method. Interests lie in the open field of observation and are already being extensively studied. They will no doubt be more extensively studied in the days to come. Better and better ways will probably be devised for determining whether the individuals in a given group or in the nation at large are interested in a given objective, and whether they are more interested in it than in certain other objectives.

An end, when and if achieved, is conceived as a state of human welfare, a condition in social life. If one proposes prohibition of the sale of intoxicating liquor on a nationwide scale, we are confronted with the question, How will it probably affect the general picture of social life? If dependable data relating to its effects in this or other nations are available, these data are consulted first. Then are canvassed the considered opinions of persons whose experience and training seem to give them a preferred position as judges. Finally, with such information before them, the population in a democracy or its political representatives are polled. The vote is taken as an approximate measure of value. Thus in a democracy are political and economic ends selected, though seldom educational ends. The latter are usually left to representatives of the people in a legislature or a board of education, after a recommendation by an assumed expert. But it is neither improper nor inconsistent with the democratic tradition for great educational issues to be taken to the people for decision.

Which reminds me of an absolute idealist who created a considerable stir in psychology during the early years of the present century—Hugo Münsterberg. It is painful to recall, for example, how one evening in his seminary, Münsterberg administered a *coup de grâce* to democratic government with the impressive assertion that one cannot derive the truth from a majority vote. And so, apparently, we did not in the postwar adoption of prohibition. But nobody imputes clairvoyant insight to the maker of an American ballot. His vote for prohibition was a positive reaction reflecting a readiness to undertake an experiment which might or might not eventuate in keeping with his evaluation. It is a privilege of a democratic citizen, as it is of a scientist, to alter his attitude as new facts develop. Thus values, like truths, are arrived at by experiment. Whether the democracy shall be "wet" or "dry," indeed its form in general, we believe, should be determined by experiment. This is an impossible method for one who is obsessed with the infallibility of his own ideas in the discovery of ends and would be limited to the discovery of means.

A Crucial Educational Problem

The most vital question in education today concerns the direction of its orientation. When the ends are determined, the orientation is determined. If the ends are selected by the cult of the infallible, what is in store for the curriculum but the stagnation of a dogmatic religious creed? The proposal to inquire into the fundamental principles of the various sciences and to investigate the interrelations among the sciences, with a view to a better grasp of the organization of human knowledge and thence of the foundation of the curriculum, indeed to organize a special faculty to conduct such research to this end, need not strike terror to the heart of any scientific educator. He should favor the extension of scientific study to the fundamental concepts employed or implied in his and other subjects. But this program of research can be carried out in an empirical or scientific universe of discourse and indeed is now under way on an international scale in the unity-of-science movement. The real threat to scientific interests lurks in the personnel of the "metaphysical" faculty. If the court is packed with the cult of the infallible, the nature of the decisions can safely be forecast.

If justification were needed for the rather lengthy discussion of the Chicago situation, it may be found not only in the wide interest taken in this situation but also in the fact that the problem involved suggests the need for the type of fundamental inquiry which was hereinbefore defined as the philosophy of education.

Humanism and the Causal Law

The pragmatism of James (13), the instrumentalism of Dewey (8, 9, 10), the experimentalism of Kilpatrick (14), and the organic realism of Whitehead (19) are all empirical philosophies. They accept the unity of science and philosophy. They rely fundamentally on generalizations based on particular experiences. In fact, all four of these outlooks may be described as generalizations of the scientific method. Where they diverge one from another in educational theory, or elsewhere, the divergence is mainly due to varying interpretations of available fact. Lastly, each of these philosophies may be described as humanistic, and so moralistic. They are philosophies of restrained optimism, but they are melioristic in their attitude toward human life and social problems. This means that they entertain a theory of the possibility of human betterment through moral action as over against a common interpretation of causality, supposed to be scientific, which pictures measures of human uplift as futile gestures and morality as an empty dream—as idle as a painted ship upon a painted sea.

In drawing toward the close of the chapter, it should be helpful to hold a problem up for brief examination, a problem which too few have boldly faced and one which Russell (18) says may end by disrupting our civilization. The problem may be stated as follows: Can one entertain a scientific conception of natural causation and consistently believe in freedom, morality, and humanitarian effort? If there is no freedom there can be nothing deserving the name of morality, and endeavors toward human uplift become illusory incidents in a vast complexity of cosmic weather. The problem should be faced by every educator who prides himself on the rationality of his outlook.

Trend Away from Scientific Determinism

The philosophy that underlies the notion of scientific determinism usually envisages a physical world composed of inert material objects related in a system of push and pull, attraction and repulsion, where man finds his place as one of the objects, possessed of a conscious life that accompanies events in his material organism as inertly as a shadow follows him in the sunshine. Essentially the same materialistic view colors the thought of one who believes in a universal "reign" of causal law.

This approach to the problem has rapidly lost ground among many of the distinguished thinkers of our time. In the first place, the conception of matter as an inert substance or as a substance of any kind is now widely discredited. Whitehead reflects the trend of modern thought in the view that there are no "vacuous entities." Moreover, human vassalage under a "reign of law" tends to disappear with the modern conception that science is descriptive rather than explanatory. The law of gravitation, for example, is descriptive in the sense that it merely expresses the spatial-temporal relations observed when bodies fall. To say that gravitation is the cause of the event observed is a prevalent and peculiar inversion of thought. A law of gravitation, expressed in mathematical form, is a description of the behavior of an entity in relation to another entity.

Whether the entity has the relative simplicity of an electron or the relative complexity of a human body, it can be conceived as an active organism possessing characteristic modes of behavior, modes of response to other entities. Science investigates these modes of behavior, but, ultimately, stands in baffled silence before the question, What explains the action? The behavior pattern dictates the law, not the law the behavior pattern. The present program of science is complete when the form of the entity and its reaction system have been mathematically described.

What Is Freedom of Conduct?

What is freedom in a world so constituted? In such a world the freedom of an entity seems to be satisfactorily defined as the absence of external determination. That is, one is free if not deterred by external circumstances from acting as one wills. This but reaffirms a conclusion previously published, with which the chapter may be brought to a close:

> To discover what hydrogen does in the presence of oxygen explains in no way the doing. The event is simply found by science and recorded *post rem.* Do atoms,

like the moon, shine from borrowed light? Are they mere unwinding clocks? What principle of rationality requires one to believe that energy is forever borrowed from elsewhere, or from some single pervasive source? The secret of that which is observed is hidden away in the elements themselves, for aught that science teaches. Thus are oxygen and hydrogen said to have certain ways of acting, certain modes of behavior. Refer to them as bonds, or affinities if you like. These are theirs, attributable, so far as known, to nothing elsewhere. And, if the simplest element conceivable reacts independently in the simplest way possible toward any other element, there is freedom of action. Freedom of action is freedom to act. It means the opportunity to act in accordance with one's nature, the opportunity to be oneself (5).

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CHAPTER V

Methods of Teaching

STEPHEN M. COREY and VIRGINIA MOOK

THE CONCEPT OF GENERAL METHODS OF TEACHING is so broad as to need empirical delimitation in any summary of research data. In one sense the teacher's method includes everything that he does in the classroom as well as the maintenance of many nonclassroom conditions that affect learning and over which the teacher has some control. Broadly conceived, part of the teacher's instructional method might involve his ability and willingness to regulate the amount of fresh air in the room. The term is not so broadly defined, however, in the pages that follow. They summarize the research reported within the past three years which has been concerned with evaluating the relative effectiveness of certain general procedures employed by teachers. The best practical definition of these general procedures or general methods is the following list of names that have been applied to various ones of them—the activity method, the case method, the conference plan, the demonstration method, the discussion method, the laboratory method, the lecture method, the problem method, the project method, the seminar method, supervised study, the unit plan, and the recitation method.

Each of these methods has been variously described. One of the chapters in this Review is devoted entirely to a consideration of the "activity method." Consequently, the considerable body of literature in this area is omitted here. Inasmuch as any investigation of general methods always involves some particular instructional materials or subjectmatter, the line between "general" and "special" methods is a vague one.

During the three years 1939, 1940, and 1941, few research articles dealing with general methods were published. Under eighteen different headings in the *Education Index* there were forty titles so worded as to imply research, but of this total only fifteen reports actually involved scientific investigation. While there was a rather large number of titles such as "An Experiment with the Project Method," "An Experiment with the Laboratory Method," or "An Experiment with the Lecture-Demonstration Method," the word "experiment" was used loosely. Statistical data were not reported and the experimenters usually confined themselves to discussing the relative merits of the various methods and describing subjective impressions of effectiveness.

Classification and Use of Various General Methods

Monroe and Marks (12) classified the various general methods of teaching, as named previously, under the following headings: (a) the lecture method, which consists primarily of extended discourse by the teacher supplemented by assignments; (b) the recitation method, involving an emphasis upon extended questioning of the pupils by the teacher; (c) object teaching, or the frequent use of concrete, tangible objects such as animals, plants, and colored cards, which pupils observe and study and about which the teacher asks questions; (d) the developmental or Socratic method; (e) the laboratory method, in which the classroom becomes a workshop furnished with the tools of living; (f) the project method, in which the pupil "purposes" to do something voluntarily or as the result of stimulation by the teacher and in which all the learning is related to this purpose; (g) the problem method, in which the teacher makes the assignment in terms of a problem and thus directs the situation; (h) the socialized recitation, which involves a considerable amount of teacher-pupil cooperation and extensive use of discussion technics; and (i) the Morrisonian unit-mastery procedure. This last is most commonly found at the secondary level and involves pretesting, teaching, testing the results of teaching, adapting the procedures, teaching and testing again to the point of actual mastery. Monroe and Marks agreed that the distinctions between these various methods were in many cases artificial and that during one class period a particular teacher often employs a variety of methods in order to attain a given end. Bumatay (1) circularized a large number of teachers in Texas elementary and high schools to find out the extent to which various methods were (reported as being) used.

The most extensive investigation of certain consequences resulting from use of the various general methods in high school was reported by Edmiston and Braddock (4). Pupil-attention was measured by trained observers using the procedure suggested by Morrison. The four methods which produced the best attention were, in order of efficiency: student reports, demonstration, pupil-dominated general discussion, and workbook.

Project Method

A committee appointed by the Progressive Education Association (14) generalized favorably upon results from sixteen research studies concerned with the relative effectiveness of "newer" methods of teaching involving numerous projects versus various other methods. Heaton and others (7) have shown that teachers who attend summer workshops in which the project type of learning is emphasized subsequently modify their instructional behavior markedly. There was a tendency for workshop participants to place greater emphasis than did other teachers upon the importance of changing their courses in order to make them better adapted to the present needs and interests of pupils.

Lecture, Demonstration, and Discussion Methods

Degering and Remmers (3) reported upon the relative effectiveness of individual laboratory work and the lecture-demonstration method in the teaching of organic chemistry to home economics students. While the measuring technic employed was approximate and subjective, the authors found that the lecture-demonstration method was effective and they urged its adoption in view of the amount of money that would be saved in comparison with the individual laboratory method. A second investigation of the lecture-demonstration method versus the individualized laboratory method was conducted by Steen and James (15) and involved the teaching of physics. These authors reported that for high ability students the lecture-demonstration method was superior whereas students of lesser ability learned more effectively when they were given opportunity for individual laboratory experiences. A third study of the relative effectiveness of the lecture-demonstration and individual laboratory work was made by Elder (5) in chemistry. The research data included mostly statements of opinion by a large number of teachers, such as: "Do you believe that beginning chemistry can be taught effectively without individual laboratory work?" Sixteen percent of the respondents said "Yes" and 84 percent said "No."

Using the radio method of presentation, Lohmeyer and Ojemann (9) determined the relative effectiveness of three types of oral presentation for developing functional concepts and related attitudes. Sixth-grade children were used and the following three content areas: history, science, and literature. The three methods employed were (a) straight talk in the second person, (b) informal discussion using several voices, and (c) dramatization. The conclusions were that the talk and dramatization methods were significantly superior with respect to all types of subjectmatter and all groups of subjects.

Group Discussion

Miller (11) investigated the group discussion method in an advanced course in educational psychology. He recorded all responses for each discussant during twenty class meetings and then compared the five best students with the five poorest students in terms of the different types of comments made. As a result of his analysis, Miller recommended that in order for class discussions to be most effective, teachers should (a) encourage students to express the opinions that they already have on the problem under consideration, (b) encourage students to locate specific problems for discussion, and (c) provide opportunities for the interpretation and organization of newly acquired information. Zeleny (16) reported the results of a study of the effectiveness of the small group discussion method in sociology as compared with the more conventional large group discussion-recitation method. In the former, the larger groups were broken down into several small groups of five students each. All of Zeleny's differences were in favor of the small group procedure, but in only one out of approximately twenty cases was the difference statistically significant. The students reported that they enjoyed studying sociology more when there was opportunity for small group discussions.

Unit Method

Ellwood (6) evaluated the unit-directed study procedure in the teaching of modern history in high-school classes. His method consisted of the following cycle: presentation, directed-study period, discussion, and a test. A control group was taught by the traditional recitation method and special tests were constructed to measure understandings, attitudes, interests, and skills. Despite the low critical ratios which resulted from the data, the author concluded that the unit-directed study procedure is apparently superior for developing understandings and skills, the recitation method is evidently better for developing attitudes, but no definite conclusions can be drawn as regards interests.

For a number of years Michener (10) has experimented with a modification of the Morrisonian unit plan. Thirty-three experiments were conducted in various types of schools, using subjects from the sixth-grade to the graduate level and involving material from numerous subjectmatter areas. Michener's plan includes the following five steps which he believes are not adequately emphasized by Morrison: group study, individualization, generalization, action, and evaluation. The author concludes that while his method is satisfactory in all grades, it seems especially well suited to social studies courses dealing with problems and in which the major objective is modification of behavior. The method is less successful when used in connection with units in which the major objectives are appreciations or the acquisition of skills. Michener warns that the method is useless in the hands of weak teachers.

Individualized Teaching

Olson and Kambly (13) investigated the relative effect of the following three types of teaching upon the learning of general science by ninth-grade pupils: (a) group instruction, during which the entire group usually engaged in the same activity; (b) individualized instruction, in which the teacher aided individual children and tried to differentiate suggestions in terms of their needs; and (c) a composite method, in which pupils went along on their own but received help when they requested it. These authors concluded that the method in which youngsters were given individual help whether or not they asked for it was most effective.

Inductive Method

Katona's monograph (8) does not deal directly with methods of teaching but his findings are of some pertinence to the topic. He conducted a long series of experiments involving the relative effectiveness of learning by memorizing and learning by understanding. The latter usually involved induction and was defined as "the organization or reorganization of the given material by the learner." His experiments involved a great range of materials from tricks with cards and match sticks to an understanding of economic principles. His chief conclusion was that learning by understanding is superior to learning by memorizing if retention and transfer are the desired objectives.

Conclusions

A review of the research dealing with general methods of teaching might well conclude with a quotation from the *Encyclopedia of Educational Research* (2), "The experimental research relating to patterns of instruction is subject to a number of criticisms. The experimental factor is complex, in some cases curriculum reorganization being involved; the control of non-experimental factors, especially teacher skill, zeal, and enthusiasm, is seldom adequate; the measurement of the outcomes of instruction is rarely satisfactory; and the period of experimentation is usually not long enough for the pupils and teacher to become adjusted to a new method. Furthermore, all the patterns of instruction are not intended to serve the same functions. For example, the arguments advanced for the 'project method' emphasize outcomes that are not claimed for the 'recitation method' and the 'lecture method'" (p. 726).

The authors of this chapter in the REVIEW are of the opinion that the research in general methods during the period under consideration has not been fruitful. They are convinced further that the teaching situation is so complex that attempts to establish the relative superiority or inferiority of anything so amorphous as a "general method of teaching" are almost certain to be indecisive.

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CHAPTER VI

Radio and Records in Education

SEERLEY REID and DANIEL DAY

TODAY NINE-TENTHS OF THE HOMES in the United States contain radios, but less than one-half of the schools of the nation have radios. Most pupils, even today, go through school without ever hearing broadcasts in the classroom. Radio is of value in American schools and classrooms in various ways:

1. Classroom listening to school broadcasts produced by network organizations, radio stations, state universities, and local school systems.
2. Classroom listening to educational records and transcriptions.
3. Classroom or auditorium listening to general broadcasts on the air during school hours, for example, speeches of the President or other public leaders, openings of Congress, symphony concerts, and news broadcasts.
4. The educational use in classrooms of programs broadcast during out-of-school hours.
5. Radio courses, units, or clubs in science, speech, dramatics, social studies, and other subjectmatter areas.
6. The presentation of school sponsored programs, usually with student performers, over local radio stations.

Literature Dealing with Radio [1]

To those interested in developing an understanding and an appreciation of the potentialities of radio as an educative medium, there are a number of excellent references. These may be divided into seven groups. In a first group are various books dealing with the writing and production of radio programs, as (7, 20, 79, 130, 152, 168). While such books are probably most valuable to high-school teachers directly concerned with radio workshops, they offer suggestions to all teachers interested in using the technics and methodology of radio in vivifying ordinary classroom procedures. A second group of references consists of radio dramas and radio discussions (15, 26, 27, 64, 83, 97, 98, 99, 150, 151, 166, 167). In addition to plays there are available printed transcripts of such series as "America's Town Meeting of the Air," "University of Chicago Round Table," "American Forum of the Air," and "Invitation to Learning."

The present world crises and the prominence of radio news analysts and commentators will undoubtedly increase the importance of a third category—that of the personal experiences and interpretations of radio journalists. Already a number of such books have been printed (57, 61, 92, 126, 127, 128, 129, 131, 138). In a fourth group are numerous books and pamphlets which deal with the development of radio policies and practices in the United States, such as (16, 19, 37, 38, 46, 48, 66, 68, 93, 122, 123).

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[1] Although this is the first general treatment of radio and education in the REVIEW there have been a number of sections on radio in connection with particular phases of education. Studies reviewed in these earlier discussions have been eliminated from the present chapter. For earlier treatments see the following: 11: 412, 453; 10: 13, 118, 215, 434; 8: 36, 44, 383; 7: 68; 6: 315, 489; 4: 470.

Fifth, there are publications of organizations devoted to the promotion of educational radio: the twelve yearbooks (1930-1941) of the Institute for Education by Radio, the five yearbooks (1931-1935) of the National Advisory Council on Radio in Education, and the three yearbooks (1936-1938) of the National Conference on Educational Broadcasting; pamphlets and documents of such organizations as the Federal Radio Education Committee (12, 39, 40, 41, 103, 104), the U. S. Office of Education, the National Advisory Council on Radio in Education (21), the Evaluation of School Broadcasts (76, 77, 90, 101, 107, 108, 110, 111, 112, 113, 114, 116, 117, 119, 124, 154, 155, 156, 160, 161, 162, 164), the School Broadcast Conference, and the Committee on Scientific Aids to Learning; and regular bulletins and newsletters of the Federal Radio Education Committee (42), the National Committee on Education by Radio (95), the Bureau of Educational Research (Ohio State University) (74), the Columbia Broadcasting System (24), the Mutual Broadcasting System, and the National Broadcasting Company (94).

In a sixth group are various magazines and magazine issues dealing with radio—the three trade journals, *Variety*, *Broadcasting*, and *Radio Daily* (106); the annual volumes, *Radio Annual* (106) and *Variety Radio Directory* (145); the miscellaneous "fan" magazines such as *Movie and Radio Guide* and *Radio Stars;* and the newly established journal of the Association for Education by Radio. Entire issues of several magazines have been devoted to the educational, psychological, and sociological aspects of radio (2, 35, 36, 59, 60, 102).

Seventh, there are various references devoted to the problems of using radio in school (10, 30, 41, 51, 54, 62, 65, 75, 96, 120, 159).

Research and Summaries of Research

During the last ten years there have been several hundred investigations dealing with the uses of radio in school and classroom. Unfortunately, many of these studies have been superficial, inconclusive, and uncoordinated with each other. Despite the excellent list of research problems suggested by Charters (21) in 1934, much of the research itself has been concerned with petty problems and has led to insignificant conclusions. Fortunately, however, during the last five years there have been three radio research projects, financed by the General Education Board and the Rockefeller Foundation, and two of them sponsored by the Federal Radio Education Committee of the Federal Communications Commission. The findings of these three research staffs—one at the University of Wisconsin, one at Ohio State University, one at Columbia University (formerly at Princeton)—have done much to answer questions puzzling broadcasters and educators.

In one of the best references on the methods of radio research, Lumley (78) examined with critical insight the research up to 1934. A year later Cantril and Allport (19) presented a series of investigations dealing with voice and personality, sex differences in radio voices, speaker versus loudspeaker, listening versus reading, and effective conditions for broadcasting. Wrightstone (165), with the assistance of the Evaluation of School Broadcasts staff, summarized the research up to 1939. Two issues of the *Journal of Applied Psychology*, February 1939 and December 1940 (59), both edited by Lazarsfeld and Stanton (69), presented research investigations completed during 1941. With so many investigations being carried on throughout the country, Beville and Daniel (12) suggested a classification of educational radio research.

Findings of the three radio research projects have been published as follows: Many of the investigations of the Columbia (formerly Princeton) Radio Project have been included in Lazarsfeld's discussion (68). The results of the Wisconsin study have been summarized in a report by Barr, Ewbank, and McCormick (8). At Ohio State University, the findings of the Evaluation of School Broadcasts staff have been published in mimeographed form in approximately fifty individual bulletins. The influence of these subsidized research projects upon graduate research is evident in the bibliography.

Radio and Sound Equipment in Schools

The first nationwide survey of radio and sound equipment in schools was made by Koon and Noble (63) in 1936. These investigators, in a survey of 82,297 schools, found only fourteen radio sets per one hundred schools and only one school in a hundred with a central radio sound system. Phonographs were more common, there being forty-six phonographs per hundred schools with, however, an average of only nine records per school. Equipment was found most frequently in the schools of New Jersey, Ohio, Delaware, Connecticut, and Massachusetts. Two years later, in 1938, Stanton (134), in a survey of 11,169 school teachers throughout the country, reported that 36.4 percent of the respondents had classroom radio facilities. Not satisfied with the representativeness of the respondents, Stanton sent out a follow-up questionnaire to nonrespondents and found that only 23.8 percent of the respondents to this second questionnaire had classroom radios. He concluded, "It is reasonable to assume an even lower percentage of ownership among the remainder of the sample from whom no replies were ever received."

A survey of members of the Departments of Elementary and Secondary-School Principals of the NEA, made by Reid (108) in 1939, showed that radios were available in 77 percent of the elementary schools and in 61 percent of the secondary schools. Probably the most reliable and comprehensive survey of radio equipment in schools is the one of Ohio made in 1941 by the Evaluation of School Broadcasts staff and reported by Reid

(114). Replies were received from 2,348 Ohio schools and data gathered so that replies of nonrespondents could be estimated accurately. The survey covered all public schools in the state—rural and urban, elementary and secondary, one-room and consolidated. Fifty-five percent of the schools reported having radios; 12 percent had central radio sound systems; 37 percent had record playing equipment. Other surveys of states have been made in Maryland by Barnes (6) and in Iowa by Denger (33).

In the survey of Ohio schools (114), principals reported these uses of central sound systems: reception of radio programs for classroom listening, broadcasting of administrative announcements, broadcasting of talks and speeches, and broadcasting of student dramatizations. In master's theses, Haynes (53) and Rudy (125) discussed the school uses made of sound equipment. In another thesis, Young (169) described the procedure, step by step, of installing sound equipment in a school. Probably the best discussions of equipment are the ones by Lowdermilk (74, 75, 77) in which he explained the actual and potential uses of radio sound systems and of transcription players, and the report by Hogan and Wilmotte (56) dealing primarily with the cost of auditory aids in the classroom.

What's on the Air?

There are in the United States three types of school broadcasts distinguishable by their geographical scope or coverage: (a) broadcasts of the radio networks available to schools in most states from coast to coast; (b) programs broadcast over a single station or a regional network of stations to schools in a single state or geographical region; and (c) broadcasts originating in individual cities and intended for classroom consumption in local schools. Most of this broadcasting is done by commercial stations rather than by educational stations. From 1921 to 1936, according to Frost (45), there were 202 licenses granted to educational radio stations. Of these 202 licenses, 164 were allowed to expire, were transferred, or were revoked so that on January 1, 1937, there were only 38 broadcasting licenses held by educational institutions.

There has been comparatively little descriptive and analytical research dealing with the school broadcasts of the Columbia Broadcasting System, the Mutual Broadcasting System, and the National Broadcasting Company. Probably the best descriptive analyses of network school broadcasts are those of Reid (107, 109, 111, 112, 116), Robbins (119), and Wiebe (154), who studied the five 1940-1941 series of the CBS "American School of the Air." From these studies they concluded that the broadcasts were generally and sometimes extremely valuable educational experiences, but that throughout the series there were numerous curriculum defects and deficiencies. They made these recommendations: (a) that responsibility for a nationwide school of the air be vested in an educational organization rather than in a commercial organization; (b) that the planning of the radio series be delegated to specialists in public-school curriculums;

(c) that network broadcasts be focused upon broad areas of knowledge and cut across traditional subjectmatter boundaries; (d) that broadcasts be construed in terms of the unique educational advantages of radio; (e) that all individuals responsible for the planning and producing of school broadcasts have a knowledge of classroom conditions; (f) that printed aids to accompany broadcasts be accurate and specific; and (g) that a continuous program of evaluation be carried on during a broadcast series.

In master's theses, Hayden (52), McHugh (80), Smith (133), Swinebroad (137), Taylor (140), and Wolf (163) gave partial descriptions of the broadcasting activities of radio stations, universities, and local school systems. In the most extensive survey yet made, Atkinson (3, 4) described radio education in 126 American cities. Darrow (29) sketched the history of school broadcasts. Darrow (31) also traced the development of the "Ohio School of the Air" which he founded in 1930. The story of the "Wisconsin School of the Air" has been told by Bartel (9) and in the report of the Wisconsin research project (8).

Criteria for Judging School Broadcasts

After a year's experience in listening to school broadcasts, Reid and Woelfel (117) listed a series of criteria under three general headings: educational value, clarity and comprehensibility, and interest and appeal to classroom listeners. In evaluating the 1940-1941 series of the "American School of the Air," Reid (107, 112, 116), Robbins (119), and Wiebe (154) used these criteria. In an appraisal of an NBC series, O'Steen and Miles (101) used similar standards, but in an evaluation of sixty school broadcasts submitted in the Fourth Exhibition of Recordings of Educational Radio Programs, Miles (90) developed four criteria: (a) appropriateness of the material to radio presentation, (b) relevance of the material to the experiences of listeners, (c) emphasis upon the social aspects of the subject being treated, and (d) stimulus to further activity by the listeners. In two studies, one of the Damrosch music appreciation programs and the other of thirty educational music broadcasts, Wiebe (155, 156) developed seven criteria specifically applicable to music broadcasts. Bird (13) used fourteen criteria for judging broadcasts used in the classroom and eleven standards for educational broadcasts intended for home use. Rowland, Tyler, and Woelfel (124) used three categories in discussing specific standards for children's radio programs: social ideals of American life, personality development of the child, and showmanship or entertainment quality of the program.

Upon the basis of teachers' appraisals of the 1940-1941 "American School of the Air" series, members of the Evaluation of School Broadcasts staff (111, 120, 154) recommended that a school broadcast should be comprehensible to listeners in all grades for which it is intended; that the material be related to the experiences of students; that the content be organized into a simple and coherent structure; that a consistent pattern of presentation be followed from week to week; that there be comparatively few scenes, episodes, and characters; that sudden shifts in time or place be avoided; that the vocabulary be understandable to classroom listeners; that dialect be used seldom or not at all; that sound effects be used judiciously and sparingly; that voice fading as a transition technic be avoided; that appropriate humorous dialog and situations be used; and that the programs be dramatized.

Kinds of Radio Programs and Their Effectiveness

Lumley (78) classified radio broadcasts into six categories: (a) radio lessons with a radio teacher taking the place of the regular classroom teacher; (b) radio talks; (c) recitations or readings; (d) interviews, debates, and forums; (e) dramatizations; and (f) musical programs with supplementary comments. There is no conclusive evidence concerning the relative effectiveness of these methods, although classroom listeners seem to prefer dramatization. Lohmeyer and Ojemann (72) used three types of presentation (drama, talk, and discussion) with three types of broadcast material (history, science, and literature) and reported that in the acquisition of information the drama and the talk were superior to the discussion, but that in the influence upon attitudes there was no difference between the three methods of presentation. Willis (158) found dramatization most effective and talk least effective. With a group of twelfth-year students, Howell (58) compared a roundtable and a forum presentation; with the roundtable discussion there was a greater gain in information but there was no difference between the opinion changes recorded in the two groups. Using an information test as the criterion, Webster (148) found no difference in the effectiveness of a talk and a drama dealing with historical characters.

As for the rate of speech, Lumley (78) recommended that broadcasts for school children be spoken more slowly than broadcasts for adults (a fact sometimes forgotten by educational broadcasters). Cantril and Allport (19) found that radio talks are more comprehensible and interesting if delivered at relatively low rates of speed, and recommended the following limits:

Theoretical material	110-130 words per minute
Factual exposition	120-140 words per minute
Directions	90-115 words per minute
News	120-140 words per minute
Narrative	120-150 words per minute

Cantril and Allport (19) also reported that talks should be from ten to twenty minutes in length; that specific illustrations aid in the understanding of an idea; that the use of short sentences helps in the presentation of factual material; and that most listeners prefer male announcers to female announcers. Smith (132) reported that the speed of delivery depends upon the type of listeners and the length of the broadcast.

Who Listens to School Broadcasts?

Only a partial answer can be given to this question. In 1938 Frank Stanton, director of research, Columbia Broadcasting System, made a nationwide survey of school listeners to network broadcasts, but the data have remained in the files of CBS. From a survey in 1940 of 1,160 members of the Departments of Elementary and Secondary-School Principals, Reid (108) reported these data for the "better" schools of the country: CBS broadcasts used in 38 percent of the elementary schools, in 16 percent of the secondary schools; NBC broadcasts used in 34 percent of the elementary schools, in 17 percent of the secondary schools; "Damrosch Music Appreciation Hour" with the largest audience, 6 percent of the elementary teachers and 1 percent of the secondary teachers; all series, even those intended for high-school students, with larger audiences in the elementary than in the secondary schools.

From a comprehensive survey of all schools of Ohio, one of the most advanced states in the educational use of radio, Reid (114) reported these findings: school broadcasts used in 15 percent of Ohio schools, in 8 percent of the rural and 32 percent of the urban schools, in 16 percent of the elementary and 12 percent of the secondary schools, in only 2 percent of the one-room schools; CBS broadcasts used in 7 percent of Ohio schools, NBC broadcasts in 6 percent, "Ohio School of the Air" broadcasts in 6 percent, and local broadcasts in 7 percent of Ohio schools; "Damrosch Music Appreciation Hour" with the largest classroom audience, but no series with an audience greater than 2 percent of Ohio teachers and students; all series, even those planned for secondary-school students, used more often in elementary than in secondary-school classrooms; classroom listening greatest in urban areas close to radio stations, particularly in Akron, Cleveland, Toledo, and Zanesville.

How Teachers Use School Broadcasts

Questionnaire and observation data indicate that teachers ordinarily use school broadcasts as curriculum material supplementary to the course of study. The teachers' manuals and classroom guides prepared to accompany broadcasts seem to be based upon this supplementary nature of radio programs. One interesting exception was that of the CBS "New Horizons" series during 1941-1942. Mr. Adamson (1), the scriptwriter, prepared a textbook, *Land of New World Neighbors*, published by the McGraw-Hill Book Co., to be used in conjunction with the broadcasts. Woelfel and Wiles (162) found that skilled teachers spent some time before the broadcast in checking mechanical arrangements, discussing the subject of the broadcast, and otherwise preparing students for what they were about to hear; that during the broadcast teachers listened as members of the audience; that half of the teachers encouraged note-taking; that following the broadcast students reviewed the content and discussed the production of the program. Reid (110) reported that the teachers spent approximately an hour a week in using a series of social studies radio programs—eight minutes before the broadcast, thirty minutes listening, and twenty minutes following the broadcast. Woelfel and Robbins (161) reported that all classes in a junior high school listened each Friday to a series of social studies broadcasts, with sufficient time before and after the radio program to allow for discussion. Both the teachers and the investigators believed that the educational values far outweighed the inconveniences of this schoolwide use of radio.

Experimental Comparisons of Radio and Nonradio Learning

By and large, studies of "radio" and "control" groups have been inconclusive, except to show that educational changes can result from radio listening as well as from other classroom procedures. The final report of the Wisconsin studies (8:194) stated: "In general the experimental studies carried on as a part of this investigation yielded decidedly mixed results. The comparisons consistently favored the radio groups only in the field of music, and even here several of the differences were not large enough to be statistically significant." In the acquisition of information, Wiles (157) reported that a group of junior high-school students learned more from listening to a series of news broadcasts than did a comparable group of students who studied current events in the classroom. Miles (88) reported in favor of the radio group. On the other hand, Baker (5), Cook (25), and Mueller (91) found no significant differences in the amount of information acquired by radio and nonradio pupils, and Loder (71) reported results favoring the presentation of material directly rather than through a loud speaker.

With attitudes as with information, the research evidence is inconclusive. Davis and Nichols (32) reported that broadcasts designed to influence attitudes of pupils toward Japanese increased the variability of their beliefs. Lumley (78), Miles (88), Wiles (157), and Reid (110) studied the effects of broadcasts on attitudes, with varying results. Lowdermilk (73, 100) used both recordings and printed versions of the recordings to check the relative effectiveness of listening and reading in influencing pupils' attitudes toward the rights of freedom of speech and of assembly. He found that reading was more effective than listening, but that reading the script while listening to the recording seemed more valuable than reading alone. Of six studies (28, 88, 91, 115, 149, 157) dealing with the effect of school broadcasts upon pupil interests, only one showed a significant increase in interest concurrent with the radio listening. After careful study of these various "controlled" studies, one must conclude that they add little to educational knowledge or to educational research. In many of them, the hypotheses were not formulated precisely, the experimental factor and other influential factors were not rigidly controlled, the validity and reliability of the experimental criteria were not established, the groups of subjects were not adequately equated, and the statistical technics were not carefully chosen.

Comparisons of Comprehension by Aural and Visual Means

Cohen (23) worked with several hundred public-school children in New York City and found the results of reading versus listening to ten factual stories were inconclusive. Goldstein (47), using groups of adults as subjects, presented in two ways and at seven rates of speed passages from the McCall-Crabbs Standard Test Lessons in Reading. He concluded that listening comprehension was greater than reading comprehension. Goldstein recognized the artificiality of his experimental situation, especially that of reading passages projected upon a screen rather than from a magazine or a book. School children, more habituated to reading, cannot be assumed to learn more easily by ear than by eye. One finding of Goldstein's has important implications for educators, namely, that there is extreme variability in individuals' listening comprehension. Teachers can no more assume that all students listening to a broadcast understand what they hear than they can assume that all students who read a book understand what they read.

Finally, there are Lazarsfeld's insights (68) into the problem, substantiated by numerous research studies conducted under his direction. In general, he found that the lower the cultural level of listeners, the more they listen to the radio; the lower the cultural level of people, the more likely they are to prefer listening to reading; the higher the reading skill of a certain group, the more they prefer to read than to listen to comparable information; and the greater the interest in given subjectmatter, the more strongly will people prefer the medium which gives the fuller treatment. For example, the more interested people were in current events the more they preferred newspapers to radio as a source of news, but the more interested they were in baseball, the more they preferred radio to newspapers as their source. Of the controversy concerning "eye versus ear" learning, Lazarsfeld pointed out that "for every study which shows that the ear is more receptive, another study can be quoted which attributes the same advantage to the eye. The truth seems to be that the physiological means of perception is of itself of only small importance in the communication of ideas; what counts is the situation in which communication occurs—the reading and listening habits of the respondent and the character of the subjectmatter in question" (68, p. 199).

Transcriptions of Radio Programs

One of the phenomenal developments in educational materials during the last few years has been that of records and transcriptions. Commercial organizations, the U. S. Office of Education, and radio stations and radio networks have released transcribed programs and series of programs for classroom consumption. Some of these recorded programs are ten- and twelve-inch records which can be played at a speed of 78 rpm (revolutions per minute) on any phonograph; others are twelve- and sixteen-inch transcriptions which must be played on special machines which turn at a speed of 33⅓ rpm. As Miles (87) has pointed out, the use of these auditory aids is becoming more and more important in American schools. Many of the studies mentioned in the preceding section have been made with transcriptions of broadcasts rather than "live" broadcasts as the experimental stimulus. Recordings available to schools were surveyed and appraised by Miles (87, 89). Lowdermilk (76) noted that since transcriptions can be played whenever it is most convenient and as many times as educationally necessary, they are superior to "live" broadcasts. The controversy between "live" and "recorded" broadcasts was investigated by Wrightstone (164), who found no differences in the learning effects upon comparable groups of pupils listening to broadcasts and transcriptions of the identical broadcasts.

Radio Workshops and Pupil Broadcasting

From the 1941 survey of Ohio schools, Reid (114) reported that 3 percent of the schools of the state had radio workshops, that most of these workshops were in secondary schools, and that there were approximately forty students in a group. On the other hand, pupils in 13 percent of Ohio schools took part at one time or another during the year in presenting radio programs over local stations—from participating in a band concert to taking part in an amateur contest. From a survey of eighty-nine large Illinois high schools, Purkey (105) reported that half of the schools had presented student broadcasts during 1937-38; that the music, speech, and English departments were principally responsible for preparing and presenting the broadcasts; that the three most important purposes of student broadcasting were (a) giving students experience in radio broadcasting, (b) presenting to others an actual classroom activity, and (c) interpreting school policies to the public. Pupils are often used in the production of local school broadcasts. Walters (146) described the process followed by sixth-grade children and teachers in the preparation of 24 fifteen-minute news programs. Scripts available for high-school broadcasting were analyzed by Byers (18) and evaluated upon ten criteria.

Various aspects of the production and presentation of radio programs have been analyzed in master's theses: newscasts by Edmonson (34), radio plays by Buss (17), and voice training by Hale (50). Of more importance to one interested in technics, however, are the books on script writing and radio production written by experienced radio broadcasters, particularly those by Carlile (20), McGill (79), and Wylie (168). As for the requirements necessary for radio personnel, Levenson's investigation (70) is the most exhaustive in the field.

Radio Courses and Units in Public Schools

In 1941, approximately 15 percent of Ohio schools had radio units or courses, most of them in the fields of science and mathematics (114). One of the unique curriculum developments in radio has been that of the tenth-grade English course of study (121) in Rochester, New York. The literature, speech, and composition activities of the second-semester course are focused upon radio. With the cooperation of Rochester teachers, Reid (113) made an evaluation of the course. Stenius (135) described an experimental course in radio offered in Detroit Western High School. In master's theses, Blecker (14) and Foltz (44) discussed some of the possibilities of using radio in the classroom. Power (104) described a course in radio speech included in the high-school curriculum of Texas. Of interest to curriculum constructors are: an analysis of occupations in radio by Bartlett and Miller (11), an investigation of the objectives and content of radio speech courses by Lawton (67), and an analysis of the training and characteristics desirable in radio personnel by Levenson (70).

Curriculum Use of Out-of-School Broadcasts

A 1941 survey of Ohio schools (114) indicated that in 78 percent of the schools one or more teachers gave some attention to pupils' out-of-school radio listening, principally through occasional recommendations to listen to specific programs. In only 4 percent of the schools were there teachers who assigned radio listening, thus placing the activity upon an equal footing academically with that of out-of-school assigned reading. Reid (113) described some of the ways in which Rochester, New York, teachers made use of evening radio broadcasts. Lowdermilk (76) made an interesting study of the curriculum use of "America's Town Meeting of the Air" broadcasts. High-school students in thirty-two classes throughout the country listened to the programs at home, then spent the following day discussing the issues in class.

Radio program discrimination—Radio has grown so rapidly that few educators have seriously considered their responsibilities in developing discrimination in radio listeners. Tyler (142) presented the case for teaching radio discrimination and suggested that it probably belonged in the English area. The possibility of teaching discrimination has been studied, with varying results, by Merrill (85), Goudy (49), Heskett (55), and Robbins (118).

Conclusion

Such has been the research of the past few years dealing with radio in the schools and classrooms of the United States. Despite the mediocre quality of some of the studies, despite the insignificance of some of the findings, despite the lack of coordination between investigators and between investigations, a synthesis of the field permits four generalizations: (a) that there are on the air today many broadcasts highly enjoyable and educationally valuable to pupils and teachers alike; (b) that comparatively few teachers use this curriculum resource made available through technological progress; (c) that radio broadcasts, like motion pictures, books, magazines, and other teaching aids, can be used effectively in the achievement of educational objectives; and (d) that the possibilities of radio—as a medium of communication, as an agency of education, as a form of art and literature—have only been touched as yet in the public schools.

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CHAPTER VII

The Library in Education

HELEN L. BUTLER

RESEARCH IN LIBRARIANSHIP is a recent development. Until perhaps fifteen or twenty years ago library investigation consisted largely of enumerative bibliographies and small-scale service studies of local institutions. Since that time, however, the output has increased from a small trickle to a fair-sized stream marked by clarity and force. Whole areas still remain untouched by investigation, but where work has been attempted a scientific beginning at least has resulted.

Research in Librarianship: Bibliographies

Bibliographies of research necessarily remain limited. Waples (82) listed the theses of students in the graduate library schools of the nation. Witmer (93) extended the source by drawing off dissertations embodying the work of both education- and library-school students, but limited the area to studies of the secondary-school library. Heaps (30) supplemented her list for the years 1936-39. Carnovsky (12) restricted his choice to thirty-five works he considered progress-making and definitive. No bibliography is known to the present writer which cuts across elementary-, secondary-, college-, and public-library fields, in terms of education. No institution or agency has yet undertaken the systematic collection or abstracting of published and unpublished studies in the library field.

Philosophy and Objectives of the Library in Education

Two articles by Wilson (94, 95) called attention to the direction library service should take in college and university and to the essential factors which make for productive relations between students, faculty, and books. Branscomb (10), after a year's study at the request of the Association of American Colleges, emphasized educational effectiveness and urged that libraries be encouraged to develop plans in which the book collection might emerge as an instructional tool of first importance.

On the secondary level, Ditzion (20, 21) related the origin and development of school libraries to the work and philosophy of such leaders as Dix, Torrey, Mann, and Bernard, and paralleled library progress with educational advancement. In New Jersey (62) librarians from 165 junior and senior high schools recorded their opinions concerning the role of the library as a school activity. Most important, in the order named, were (a) teaching the use of books and libraries, (b) directing pupil leisure reading, (c) assisting instruction, (d) adjusting library service to changing class content, and (e) establishing an atmosphere of democratic cooperation. In actual practice they acknowledged the first of these to be last. The most succinct expression of the philosophy of the school library is found in the brief preliminary statement of the circular issued by the American Association of School Administrators in conjunction with the Research Division of the NEA (3). Here the library was conceived to be at once a service agency, teaching agency, book center, and reading center.

Evaluation of Library Service

Early attempts at evaluation by state departments, accrediting bodies, and local school authorities resulted, according to Spain (76), in quantitative measurements of book stock, seating capacity, and other enumerative items, which not only failed in their purpose but eventually stultified library growth. In 1936, accordingly, Waples (88) published at the request of the North Central Association his basis for the determination of qualitative standards for the college library. He recommended four devices: (a) an information schedule showing funds, methods, and policies of book collection; (b) a checklist of general reference books; (c) a checklist of periodicals; and (d) a reading record for each student and faculty member. A year later there began to appear in print some of the preliminary findings of the Cooperative Study of Secondary School Standards. From these and other data were evolved criteria (16) for evaluating the high-school library in terms of the philosophy of the school of which it is a part, of the nature of the pupils it serves, and of the community in which it is set. The rating included eight phases (Schedule F): library staff, organization and administration, book stock, magazines and special materials, book selection policy, teacher and pupil use, service policy, and adjustment to the objectives of its own school. This is the fullest and most satisfactory set of criteria yet worked out, and should prove a means of estimating not only the relative standing of a given library but also its improvement and growth over a period of years.

Library Surveys

Joeckel (35) reported to the Advisory Committee on Education on library service of all types including, briefly, public libraries, school, college, and university libraries, and, more fully, federal library service. Many of his deductions were based on conditions cited in Wilson's earlier work (92) which had pointed out the percentages of population which received library service in the states; the small number of counties which had complete public library service, and the large number (40 percent) which had none; and the location of the 45,000,000 citizens who had no access to libraries of any kind. An early publication of the U. S. Office of Education (36) presented Johnson's examination of the staff, administration, and facilities of 390 secondary-school libraries. Of the schools described, sixty-seven had no seating capacity whatever for their pupils and thirteen used no classification system for their books.

Excellent surveys of school-library conditions have been made in two states. From information reported by the schools, California (11) evaluated approximately five hundred public-school libraries. The data permitted comparisons to be drawn on many points with conditions in other states. The Regents' Inquiry of New York State centered attention chiefly on the contribution made to the reading program of the state. Thus Waples and Carnovsky (87) found that in two superior communities the quality of high-school students' reading was better than that of their parents and approached that of their teachers; that the library's educational value had a positive relationship to funds available; that the richest returns came when school and public library cooperate; and that the existing method of distributing state aid to public libraries needed revision. Smith (73) found that elementary-school pupils of New York State were somewhat below national norms in knowledge of literature; that teachers were book-conscious but limited in book knowledge and book sources; and that some of the smaller communities most poorly supplied failed to take advantage of the state traveling library.

Cooperation between Library Systems

Attempts have been made in some regions to rectify the substandard conditions resulting from inadequate financial support and lack of administrative vision by resorting to state aid and state supervision of school libraries. Permissive and mandatory legislation in this respect has been collected and analyzed by Lathrop (44). The effects of such supervision upon growth and organization have been studied by Gaver (28), Wofford (100), Barbor (6), and Hoyle (32) for certain southern states; by Churchill (15) for Illinois; by Lane (43) for New Jersey; and by Skaar (72) for Wisconsin.

Investigators have deprecated the overlapping of function and service between public- and school-library systems and have made various proposals intended to spread books more widely and with greater economy than now exists. Joeckel (35), for example, called attention to the competitive aspect of respective services. The Educational Policies Commission (60) proposed the ultimate unification of all educational activities (including public libraries) within each community under the public education authority and, until this could be brought about, suggested contractual agreements between public and school libraries. Cecil and Heaps (14) analyzed carefully various participatory schemes of service in state, county, regional, and local cooperative units, and described costs and activities in sixty-seven cities where such cooperation is in effect. They recommended full responsibility for library service by the schoolboard, accompanied by cooperation with other library agencies at all times.

So, too, a Joint Committee of the NEA and the ALA (61), evidently fearful of the loss which too-sweeping changes in school-library policy might entail, was emphatic in its declaration that the place for a school library is in the school. From practices reported in thirty-five selected communities, the Committee presented a detailed account of the activities and procedures which illustrate acceptable working relationships between school and public library. School administrators may find help in the comparative figures published by the American Association of School Administrators (3).

Library Organization and Management

Research in the field of internal management is progressing rapidly. In 1932 Allez (1) made a time-study of the activities of librarians in eight Wisconsin teachers colleges, noting the number of hours per week professional and clerical staff members said they spent on administrative, technical, routine, clerical, service, and "professional" activities. The findings were somewhat weakened by the fact that there was little agreement in definition of terms. Crookston (17) found the direct labor costs of services for 542 professional, clerical, and student staff members in eleven high-school libraries which ranked high by the standards of the Cooperative Study of Secondary School Standards. She computed the unit costs of reference, teaching, advisory, circulating, cataloging, and other services. The mean cost of acquiring a book in ten libraries was found to be 2.6 minutes, or 31 cents; circulating the volume required the same time but only 2 cents. Most expensive of the library's tasks was the preparation of a bibliography which took 98 minutes and cost $1.59. Other studies in internal management include (a) the formula worked out by Axe (5) for making book-fund apportionments in Los Angeles schools based on the average cost per book in high schools, and upon the average use per pupil-period in the social studies; (b) the cost of acquiring and cataloging a college book collection investigated by Miller (55); (c) the efficiency of separate library rooms versus the study-hall combination in Louisiana by Robert (69); (d) steps in the organization of centralized library service for New York rural schools by Rimkus (68); and (e) comparison of the professional and academic training received by secondary-school teachers and by librarians by Alstetter (2).

Adequacy of the Book Collection

The field most commonly investigated is that of the book collection, to determine quantity and quality, and/or to ascertain its use by the library's clientele. Customary procedures consist of checking the number and distribution of the titles against subject fields covered, inclusion on accepted lists, date of publication, and size of classes or enrolment. In elementary schools, grade placement also is often considered. Most complete in data collected was the Missouri study (101) made for the Committee of the Cooperative Study of Secondary School Standards, which obtained figures for the number of titles, of duplicate copies, of social science and natural science works published within ten years, of magazines subscribed for from a recommended and weighted list, and of the supplementary materials such as slides, films, pamphlets, and records. California (11) reported by level of school and size of enrolment the frequencies of possession of standard reference works, of recommended magazines, of professional books for the librarians' use, of newspaper subscriptions, and the percentage of books in each major classification. On the university level, Raney (65) checked some four hundred subject bibliographies against the holdings of the University of Chicago libraries and formulated his acquisition policy and needs upon the weaknesses so revealed. Bariani (7) took into consideration not only the book-spread according to publication date and subject distribution but ascertained curriculum strength by relating the titles to those in authoritative bibliographies, to course assignments and needs in her school, and to availability elsewhere on campus. These studies may be contrasted with that of the Bibliographical Planning Committee of the University of Pennsylvania (9) which, proceeding on the conviction that the adequacy of a collection is best judged by the faculty who use it, inspected the University's libraries department by department and shelf by shelf, and found the results good. A contrast is also found in the methods employed by Westervelt (89) who cumulated from various sources a standard juvenile book collection for New York normal schools. Martin (53) synthesized the findings of seven studies of periodicals, consulted widely, and prepared a descriptive list of one hundred selected periodicals for high-school use.

Reading and Library Use

Probably no phase of the library in education has received so much attention or ranged so widely from scientific observation to incautious generalization as has library use. Reports vary from citation of total circulation figures to detailed distributions assigned to factors believed causal or relative. Most of the studies in children's reading tie back in one way or another to Terman's early study (79), and demonstrate the soundness of his deductions on the influence of intelligence, age, and sex on juvenile reading. Lazar (46), investigating the reading interests of 2,027 New York City pupils, found that the bright pupils read more than the average or dull; that girls read more books than boys; and that while the girls who read boys' books were usually bright pupils, the boys mentioning girls' books were dull. Availability of suitable reading materials was stressed by Stribley (78) who inspected nineteen rural schools in an Iowa county. The appalling conditions brought out in his analysis of the collections were reflected in the pupils' reading, only 6 percent of which was on a standard list and 14 percent of which consisted of "Big-Little

Books." A correlation coefficient of +.72 between total books read and number of books read from the school library was thought significant evidence that the children were reading what was at hand. In 1930 Lewerenz (47) found that the higher the IQ level of Los Angeles schools, the greater the representation among public library users.

The effect that skilful instruction and a free-reading program may have in improving reading habits was demonstrated by La Brant and Heller (41), who through individual suggestions and formal class discussion were able to extend both the quantity and quality of reading done by two groups of students in the Ohio State University School over a period of three years. The writers reported marked sex differences. From records for 112 pupils, varying from one to six years, in the Bronxville, New York, high school, Eberhart (23) concluded that the seventh grade is the period of widest reading, but that, although reading in senior high school is less voluminous, the proportion of nonfiction read is almost four times as great, and the fiction reading is more mature. The negative results obtained when guidance is lacking are implied in the study by Lawshe (45) who found that pupils read no more after free reading had been introduced than when reading was prescribed; that marked decreases in biography and travel had occurred; and that fiction, some of inferior quality, had increased.

The problem of the nonreader has long interested librarians. Linderman (48) studied sixty-five nonusers of the high-school library and found that they came largely from nonreading homes; they had not been read to or otherwise stimulated to read when small children; they belonged to no out-of-school clubs and took less interest in the school's extracurriculum activities than did their classmates. Though their average IQ was only 3.4 points lower than the average for the school, 45 percent of this group was receiving failing grades. As a partial explanation of differences observed in reading habits, Moreland (57), Zeller (102), and Thorndike (81) attempted to determine basic interest patterns rather than actual reading preferences. After examining the responses of 2,891 bright, average, and dull pupils to 88 annotated fictitious titles, Thorndike concluded that sex is the most important determinant of interest, and that within the same sex bright children are most like slow children who are two to three years older. His findings should interest teachers and librarians responsible for reading-guidance programs.

Waples and others (86) synthesized the literature on social effects of reading and enumerated motives which send people to books, described the values they find in them, and hypothesized the effect that books share with personality in modifying social behavior.

An overview of college and university library use may be obtained from the articles by White (90) and Smith (74). Much additional information is available in general college surveys and in the report of the evaluation study by Waples (88). Many of these are ably summarized by Branscomb

(10). Results are not always comparable due to variations in local record-keeping and in open-shelf policies. Among more recent studies may be cited those by Thompson and Nicholson (80) and by Stieg (77) whose findings largely confirm earlier investigations in respect to mean circulation per student and subject fields most in demand. Engleman (25) rejected reserved books from her consideration in an attempt to discover the responsibility for and success of the general reading program in seventy-nine liberal arts colleges. She showed that general reading, as contrasted with reserves, had increased slightly over a five-year period; that less than one-fourth of the institutions had studied their students' reading intensively, and only seven had applied the results to their book-selection policy. Lancaster (42) found little correspondence between actual library use and the amount of instruction given.

Teaching the Use of Books and Libraries

Instruction in books and libraries is postulated in every statement of objectives for library service, on all levels. The general surveys show that most libraries make some provision for such instruction, either informally by lectures and tours during orientation week or in formal courses both with and without academic credit attached. Many textbooks and manuals have been written for such instruction but of actual research there is little. Two studies are outstanding. Reed (66) constructed a test on three levels—elementary, secondary, and college—and carefully checked it for comprehensiveness, validity, and reliability. She found that the three levels made clean-cut distinctions with 3,345 students in fourteen institutions. Dear (19) administered the Peabody Library Information Test (71) to 1,322 college students in nine colleges under classroom conditions and found it capable of discriminating between classes of different levels and between classes of the same level in different colleges. Using the elementary-school form of this test, Moore (56) found a satisfactory correlation between library skills and educational age, mental age, and achievement for 130 children but found no definite relationship with general reading performance as shown by the number of books they read. Probably no phase of the library-in-the-school needs further light shed on it than this one.

The Library and Adult Education

None of the foregoing researches pertain directly to the library in out-of-school, or leisure, education, but many of them include data which could be drawn off for the purpose (35, 86, 92). There are other studies of public library use in particular communities (cf. 12, 29, 39, 67, 84) which determine the percentage of population using or not using the library; the number of books borrowed; the education, sex, and occupation of the borrowers; and the subjects and quality of the materials borrowed. Unfortunately, the records also include books circulated to students in neighboring schools. Morriss (58), however, limited her observations to a small group of adults whose elementary-school education had been neglected. She advanced certain book-selection criteria and a short list of books meeting these standards. Egan (24) investigated the reading of young men enrolled in CCC camps and reported good results from personal advisory service. Flexner and Hopkins (26) analyzed the records of 1,250 persons, or 20 percent of the total number, who had asked help of the readers' adviser in the New York Public Library. The purpose, subjects, and extent of their reading were related to sex, education, age, and occupation. General statements of opinion on adult reading are expressed in the papers edited by Wilson (93) and in the more comprehensive list of works compiled by Beals and Brody (8).

Some Areas for Further Research

Many gaps in our knowledge of the part played by the library in education call for further study. We should like to know more about the elementary-school library: what its particular functions and performance under optimum conditions are, as distinguished from those of the secondary-school library; how to evaluate it in its own setting; the efficiency of the teacher-librarian in contrast with the full-time librarian, and the point of diminishing returns for each. High-school principals and librarians would welcome convincing proof of the effectiveness of the study-hall combination over the separate library room, and the circumstances under which this is true. For libraries of all levels information is needed on the relation of library costs to those of other units, that is, subject fields, laboratory subjects, gymnasium and health programs, and all special curriculum fields. Especially do we need more light on the nonreader, on his characteristics and whatever might explain the fact that the student who reads widely tends also to stand high in his classes. For the community at large, evidence must be secured of the most satisfactory means of utilizing the library resources of the region economically.

Meanwhile it is interesting to observe that the direction which the administration of this educational instrument should take is still under question. For many years institutional libraries followed the pattern set by the public library as a more or less independent and self-contained unit. More recently school and college libraries have proceeded on the theory that the library is not an entity in itself but an integral part of the school it serves. Because many school systems are unable to provide libraries of the caliber now considered essential, educators look to cooperation between all library agencies in a community. As has been seen, a few pioneers favor the administration of all libraries by the educational authority. The very proposal is indicative of the boldness with which current research is challenging long-accepted traditions and modes of library procedure.

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CHAPTER VIII

Visual Aids in Education

JAMES S. KINDER

In spite of the fact that this is the first systematic presentation of visual literature for the Review, it is not possible to do more than sketch in briefest form the history of the development of this field. Emphasis is reserved for the more significant researches of the last three years. Visual education is one of the most rapidly developing aspects of teaching. The term is used to identify representational and experiential materials and technics, which in one way or another are used in every effective school to clarify and intensify the learner's mental images of the object, process, or event being studied. Visual aids have been used by classroom teachers for generations; some forms, however, are relatively new.

The present review is too restricted in scope to classify all the researches done in this field, because these aids include such media as blackboards; bulletin boards; cameras; cartoons; demonstrations; excursions or field trips; films (silent and sound); filmstrips; graphs, charts, and diagrams; illustrations; maps and globes; microslides and microphotographs; models, specimens, and representations; museum materials; opaque projection; slides; and stereographs. In the literature for this field, one finds the terms "audio-visual" and "visual-sensory" as often as the term "visual" alone. To avoid what appears to some educators as a confusion of terms, Hollinger (33) suggested that the designation "perceptual aids to learning" be substituted. Thomas (67) used the same terminology. Hollinger stressed the need for emphasis on the meaning, place, and importance of the "percept" in all learning.

Two decades ago research in visual education centered around the studies of Freeman and his colleagues, Weber, Sumstine, and others. At that time research in this field was rare. Today the literature is replete with discussion articles, surveys, and careful experimental researches. *The Educational Screen* is a journal "devoted exclusively to the visual area in education." *The Visual Review* published annually presents a general summary and survey of visual development. *Scholastic*, a national weekly designed chiefly for secondary schools, devotes one section to audio-visual news. Such magazines as *The Journal of Educational Sociology* and *Education* devote one or more issues each year exclusively to this area. Practically all the educational journals carry numerous articles from time to time on visual education. Many other articles appear in the journals of the various state education associations. Textbooks, pamphlets, conference proceedings, and news letters increase the volume of material.

Many school experiences are sterile and barren. Purely vicarious and verbalistic learning of facts is not consistent with modern theories of education. Even after years of hard study the learner is somewhat like the contemporary of Emily Dickinson, of whom she wrote, "He has all the facts but not the phosphorescence of learning." The motion picture, particularly the sound motion picture, has brought a resurgence of interest in visual aids to a field that previously was rather drab and undifferentiated. The motion picture and the radio have proved to be exceptionally effective adjuncts to teaching. They give vivid and lasting impressions; detailed concepts; broad, interesting, and stimulating experiences; and variety. Half a score of years ago educators were asking, "Why visual aids?" Today the question is, "How can we use visual aids most effectively?"

Technics in Using Visual Aids

Visual education is not a subject nor is it a distinct method such as the project method, the socialized recitation, the unit plan, or the lecture-demonstration. It is a procedure which deals with visual materials. It is, therefore, supplementary to other methods much as the library and laboratory are supplementary. All these procedures, however, have their own technics for optimum results.

Lake (40) maintained that motion pictures should be previewed by the teacher before they are used in a learning unit; film ideas should be adjusted to the purpose of the lesson; there should be specific preparation of the class to receive the film; before and after the film showing there should be time allowed for related class activity; and there should be a definite "check-up" of the ideas which the pupils got from the film. Dickter (19), as a result of extended experience with visual aids at the junior high-school level, agreed with Lake, but added that teachers and pupils should use an evaluation form of some kind for purpose of future record. Dickter listed errors, or "don'ts," for the teacher as follows: (a) showing two or more unrelated films during the same period, (b) failing to have pupils know specifically the purpose of the film, (c) asking very general questions to start the discussion after a film showing, (d) showing the film at the wrong time, (e) failing to use the film a sufficient number of times, (f) reading extensively to the pupils from the teacher's manual which accompanies the film, (g) using films not sufficiently related to the unit under study, and (h) using a film when some other aid would have served better.

In a carefully controlled experiment with eight hundred eighth- and ninth-grade science students, Krasker (39) got at the heart of many troublesome problems of film usage. He found that size of class affects the learning even though films are used. (Small classes—exact size not stated—were better than large classes. Doubtless, much of this was due to the fact that better learning attitudes prevail in smaller classes.) Preparation for showing the film is essential. Classes should not be marched off to the auditorium for the film showing. The Michigan yearbook (48) stressed much the same points.

No instance of scientific research has come to the present reviewer's attention which has shown a loss in amount of learning by pupils when taught through the use of visual media. Stadtlander (66), Hansen (25), Kirkpatrick (38), Wise (76), Lamoreaux (41), Krasker (39), Bradley (10), Reitze (57), and others showed definitely that visual aids are a distinct asset to effective teaching. Also, researches show that this statement holds for all, or practically all, curriculum subjects. A few representative studies here are: in English—Ginsburg (23), Spilde (65), Holland and Netterville (32), Hart (27); in nature study and geography—Stadtlander (66), Peters (53), Repass (58), McLeese (45); in history and social studies—Wise (76), Eichel (21), Walters and Noel (71), Bradley (10); in reading—Winchell (74) emphasized the value of the flashmeter and other types of visual aids, and Berg (8) achieved excellent results with retarded readers with the use of the filmstrip; in science—McCowen (44), Maneval (46), Molyneaux (50), Bennett (7).

Other Uses of Visual Aids

Most of the foregoing studies dealt with factual learning of the classroom type. Ramseyer (54) investigated the effect of the documentary film on social attitudes. Using students from the sixth grade through college and noncollege adults, he showed changed attitudes produced by motion pictures. Social awareness can be materially stepped-up. Furthermore, the changes wrought prevail after a period of two months.

Appreciation—Educators and critics have been concerned over what appears to be a low caste motion picture appreciation. Efforts are now being made in the schools to cultivate a high type of appreciation and a body of critical-minded theater-goers. Dale's work (15) has been significant in this area. Scores of classroom teachers and principals, among them Williams (72), Allensworth (2), and Smith (63), have produced fine results. Motion picture and photoplay appreciation clubs and classes are numerous.

Picture production—Recently many schools have produced scenarios and motion pictures. In some cases this is merely activity of a spectacular type designed to impress the parents, taxpayers, or professional colleagues. In other cases, however, the making of films has a real purpose. It stimulates creative pupil activity and creates worthwhile learning situations. Hart and Wenger (29) stressed the fact that education which does not result in doing or acting is of little value. Health and safety rules must be translated into action. The Denver schools made a notable contribution to school-made films. Livermon (42) showed conclusively that much originality in acting, writing, designing, and directing is provided by school-produced films.

Public relations—Administrators see in visual aids not only valuable educational tools but also implements for the cultivation of better public relations. Here is an effective way of "selling" the school, or ever increasing budgets, to the taxpayers. Martin (47) feels that the motion picture is a modern, dignified, and impressive way of letting the public know what the school is doing. Wagner (70) made a careful survey study of the school-made film for public relations in Ohio. Thirty-eight districts in Ohio had used such a procedure, filming such topics as a typical day in the school, football, safety, May Day, teacher selection, community aspects, and public service. He showed that the school-made film has more audience drawing power than other school-community meetings. Some schools reported that attendance at such meetings in their districts had doubled. Comments and reactions of the school patrons were highly complimentary, hence Wagner concluded that school-made films "should be a part of every balanced and continuous public relations program."

Equipment

Numerous short articles dealing with equipment or surveying the equipment now found in schools have appeared from time to time. One significant reference has appeared over the last three years. The Society of Motion Picture Engineers in 1941 published a report of its Committee on Non-Theatrical Equipment (64), which is a most reliable and usable study. The Society gave pertinent suggestions concerning technical specifications, defining performance of 16-mm. projectors, and the typical characteristics of various types of screens.

School Journey

School journeys, excursions, or field trips are old technics in the teacher's repertoire. In the last decade they seem to have taken on new meaning. The Pennsylvania State Department of Public Instruction contributed materially to their development through the publication of two pamphlets (51, 52). A bulletin of the elementary principals of Los Angeles (43) provided further emphasis. The trips of Lincoln School, Teachers College, Columbia University, have been given much publicity. One of these trips (to the coal fields of West Virginia) was described by Baker (5) and an evaluation and appraisal made by Raths (55). About a year later, thirteen high-school students of Morgantown, West Virginia, made a ten-day trip to New York. Jones (36) provided an excellent evaluation of this field-study experience, showing changes in thought-pattern of the individual students. One high-school principal (59) apparently takes his high-school students on a ten- to twelve-day junket each year covering some three thousand miles or so. This principal is also looking forward to a not too far distant day when his school will offer credit toward graduation for field trips. Selke (61) has not only emphasized the values of trips but has given concern to the standards for judging field trips. The most pretentious and reliable study yet reported in this area was made by Atyeo (4).

Other Visual Media

Although the motion picture is the predominant aid in the visual field, each of the other aids has a specific part to play. No one tool will serve all the educational purposes served by visual education as a whole. Each aid has a more or less specific function. Slides and motion pictures are exceedingly valuable in teaching geography, but Waddle (69) also found the stereograph to be a useful tool in geography teaching.

Science teachers have achieved excellent results with the microscopic projection and microphotographic slide. For purposes of projecting live specimens and bringing interest and reality to the class, these media can scarcely be equalled (73). Breechbill (11), using controlled groups in an elaborate experiment at the University of Maryland, found that experimental groups of science students taught by use of microprojectors showed more uniform learning than control groups with an individual microscope for each pupil. Other results were: in general the pupils seem to prefer the microprojector method; beginning students appear to profit more than advanced students. The results of such an experiment should mean considerable savings in dollars and cents for science equipment. Hall (24) investigated the preferences of 345 high-school students in science for three basic types of illustrations—diagrams, cartoons, and photographs. He concluded that (a) age makes considerable difference in the preferences, (b) high-school seniors prefer diagrams, (c) ninth- and tenth-graders prefer cartoons, and (d) photographs are low in the preference of all groups. Somewhat along this same line, researches in recent years have shown that maps, graphs, and charts as well as pictures need to be taught.

Carthew (13) emphasized teaching such timely maps as are found in newspapers, magazines, almanacs, and the automobile road map. Cobb (14) showed how these are to be used. Wise (75), using controlled technics, showed that, with sixth-graders at least, special training in map reading and study gave greater improvement than incidental methods, and Wrightstone (77) found a gradual growth in map and graph reading ability from the seventh through the twelfth grades.

Abramson (1), Berg (8), and Earley (20) reminded us that the opaque projector, the filmstrip, and the museum still have their contributions to make. Miller (49) has substantiated the findings of earlier investigators in the matter of what children see or do not see in a picture. Children seem to miss many items in nearly every picture, and frequently the items are seen in isolation rather than as parts of a unified whole.

One of the intriguing facts that has grown out of visual education studies is that most visual aids can be used over a much wider scope of grade placements than verbal materials. Using a sound motion picture, Sherman (62) showed that even first-grade children, some of whom had not previously seen a squirrel, learned the concepts of gnawing, balancing, running, climbing, and sniffing the air better than through any other medium.

Rummel (60), using 2,100 children, Grades III through XII, concluded that films have a larger grade area than has been supposed. Stadtlander (66) came to the same conclusion.

Next Steps

The foregoing review is representative of the research and literature in visual education. The field has grown rapidly in recent years. Kinder (37) found that research is being carried on in nearly all the leading institutions of higher learning in some aspect of visual education. Many of these researches are being done in connection with the master's degree, but more and more doctoral work is in evidence. Research divides nearly evenly into administrative and technic problems. Certainly the need for research into unit studies and grade level adaptations has not progressed far. Likewise, such areas as artistic and esthetic judgments, attitudes, and learning processes await much fuller treatment and development. Bean (6) believes that we are on the verge of new and important developments. Hansen (26) and Reed (56) have outlined a fruitful field for investigation. It should also be pointed out that there are many studies, perhaps some of them of restricted range, which need to be done by the teachers in the classroom. These studies, though small in themselves, build the backlog of knowledge for the use of visual aids. This is as necessary as the larger foundation studies.

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CHAPTER IX

Educational Psychology

WILLIAM CLARK TROW

DURING THE PAST THREE YEARS investigations in the field of educational psychology were reported under various headings in issues of the Review and elsewhere: teacher personnel, pupil personnel, mental hygiene, exceptional children (35)—perhaps the most significant work in this area being the delineation of endogenous and exogenous feeble-mindedness by Strauss and Werner (84)—growth and development (61), and intelligence (62). During this period the IQ controversy (94) ran rampant with a flutter of varicolored banderillas in its neck defying anyone to administer the *coup de grâce* until the public realized it was witnessing not a struggle in the arena but a tempest in a teacup. Surveys in the Review have likewise appeared, or will appear shortly, on appraisal and on the psychological aspects of the school subjects, where the most prolific work has been in reading (96), though the increase was noteworthy in psychological investigations in the esthetic aspects of learning, particularly in music (79) and in design (100). In this chapter some of the more significant studies in educational psychology are reported following those of the June 1939 issue of the Review, but excluding the areas indicated above. Hence the material treated will relate to the whole school situation rather than to specific school subjects or activities.

The Thought Processes

Conditioning, which came as an answer to the behaviorists' subvocal tensions, has been shown by Hilgard and Marquis (36) and others to be a more complex process than the classical Russian experimentation originally implied. Responses conditioned by different perceptual configurations suggest Gestalt organization (71) and raise the question of equivalence of stimulus patterns (72) that is discussed at length by Hull (39).

Studies of transfer during the preceding six years were reported by Orata (64) who discounts "identity" and favors the more familiar explanatory phrases, "generalization" and the "reconstruction of experience." A so-called generalization method in arithmetic (90), which "emphasized the discovery and use of relationships existing among addition combinations," proved more effective than a drill method in which each combination was "a specific element with no relation to any of the other number facts." The various interpretations that can be given to generalization make it a convenient explanatory principle; but its scientific value, since its famous though elusive launching on the waters of the dart-throwing experiment, is now called into question. An effort to repeat the experiment (33) eventuated in results somewhat less favorable to generalized experience, as such, than those credited to the original reports. Katona (47) emphasized the importance of understanding as contrasted with uncomprehending drill, memorizing, and training, and Brownell (17) showed that the use of a visual "crutch" in subtraction not only did not prove to be a handicap but facilitated the learning of both bright and slow pupils.

The concept of set is apparently due for a revival since Dashiel called attention to it as a neglected fourth dimension in psychology. Though it is variously defined and often ambiguously used (29), it turns up in configural conditioning experiments (70), and in investigations of the law of effect, in one of which (99) the effect did not operate when the "learning motive" was not present, in an experiment that was disguised as one in extra-sensory perception.

In one learning study (48) the value of supervision was tested when teacher effectiveness was equated on the basis of pupil performance and reliable differences were found in subsequent pupil improvement in favor of a supervised over an unsupervised group. In another (73), the dangers of standardized testing were pointed out when high-school pupils, after a six weeks' introduction to chemistry and twenty days of intensive drill on factual material, scored better on the cooperative test than pupils who had spent a year on the subject. A series of studies by Rubin-Rabson (75), in the psychology of memorizing piano music, found little difference in the effectiveness of different methods except for the apparent value of prestudy periods. Stroud (85) reviewed the literature on learning in school situations emphasizing those studies which test out the results of laboratory investigations. The theoretical contribution of the year was Hull's "mathematico-deductive study of rote learning" (40).

Razran (69) concluded that verbal conditioning is primarily semantic, that is, that verbal stimuli can be equivalent because of their meaning-content factor. Maier (59) postulated three psychological processes to account for the various ways in which problems are solved: variability, for trial-and-error; equivalence reactions including transfer of training, for that form of concept formation in which some limited aspect of a situation comes to evoke the response; and spontaneous integration or "reasoning," which differs basically from the other two. Herrick (34) concluded that inductive problem-solving is good when it is characterized by the abandonment of wrong hypotheses before they have received a fully logical disproof and by a variety of hypotheses. Persistence in following out one hypothesis bears an inverse relation to the number of alternative possibilities (74).

Influence of the Social Environment

While hereditary influences have a determining influence as shown by studies of identical twins reared apart and of foster children (101), the structure of the social environment is recognized as of tremendous significance in the modification of human personality. Chaotic as is the field of social psychology (46), educational psychology can definitely profit from a better understanding of its data and technics. The most original work, many would agree, is that being done by Lewin (52) who has been employing topology as a geometry to represent behavior as a totality of co-existing facts having the character of a dynamic field. Following the field theory, Lippitt (55), using two children's clubs in which the effects of autocratic and democratic leadership methods were differentiated, was able to clarify many socio-psychological phenomena familiar in the school society. That experimentally-minded teachers may not confuse autocracy with petulant domination and democracy with inefficient *laissez faire*, Pistor (67) has designed a rating blank listing 120 classroom practices that can be used to aid in preparing pupils to participate in a democratic society.

The methods, results, and problems of social research, not only as they affect the school but the wider society as well, have been summarized under the authorship of several leading workers in the field (10). The time sampling technic was effectively employed by Arrington (7), particularly for the study of continuities in children's verbal behavior.

The wider social environment has begun to attract the attention of educational psychologists. E. L. Thorndike's compendious volume (92) and other studies (83, 91, 93) emphasize the continuity of the adjustment process in which the school participates. How important the human social order is in determining the course of development was suggested by way of contrast in the reports on feral children (104) in which it is absent. The objectives sought and means chosen for obtaining the desired ends differ in different cultures. The duty of education in Fascist Germany (38) is to foster adolescent ecstasy; to be Hitler's soldier raises youth to supraindividual exaltation and action and suprahuman, intoxicating conquests. A report (97) of a comparison of the work of the Bremen Institute for Youth Study for 1926-28 and 1939-40 reveals that as a result of the application of principles received from the Führer, the later fourteen-year-old group is better physically, their characters are firmer, they need stricter discipline, but their scholastic showing is not so good.

On the basis of several studies, Furfey (28) pointed out that undesirable culture traits are not changed by attention to the individual alone, but to the area, class, or group. Koshuk (50) reviewed 525 studies, made since 1925, of socio-cultural influences affecting the behavior of young children, indicating research trends; and J. E. Anderson (5) classified the results of typical studies and enumerated the chief factors conditioning social behavior, for example, selective social learning, social experience provided by the environment, equipment, and out-of-school social participation. The teacher's record of socialization within the community as described by Greenhow (31) is not an enviable one.

The school population is definitely influenced by the wider society and also by the home environment (57); and more effective procedures can be employed (30) in modifying the personality characteristics of children by means of a home-training program. But it is within the school society that the widest opportunities are found for improving the social learning program of the younger generation. The world did not have to wait for Miller and Dollard's ingenious experiments with rats (60) to learn that children imitate. Apparently those teachers who have a high degree of person-to-person interaction with pupils are effective as models and are rated high as instructors (16). Positive directions, defined as simple, specific, approving, and unhurried, were shown by Johnson (45) to be superior to those of the negative type for young children. The results of studies of the influence of the nursery school as such, however, are equivocal (42, 98) since so many other influential factors are operating. More specific studies of group interaction can well be made, such for example as that by H. H. Anderson (3) of dominative and integrative behavior.

Evaluation—A distinctive feature of recent developments in educational psychology is the evolution of measurement into evaluation programs. After surveying 129 titles, Orata (63) concluded that evaluation still has a long way to go before it can fully justify its being associated with newer school practices. Yet it is these newer practices that are largely responsible for calling it into being. A two-year study (43, 102) of the so-called activity program in a group of elementary schools in New York City resulted in the conclusion that the activity classes are generally equal or superior to the traditional in intellectual, dynamic, and social performance factors, though there is evidence that they lag behind in certain school subjects, mainly arithmetic and spelling. A survey of the research findings (68) of the last twenty-five years of progressive education reports no loss in academic proficiency and gain in terms of personal and social development. The same favorable results were reported from a restricted study (51) of college performance of a group of students following a freer program of studies in high school when compared with an equated group taking the traditional required subjects. Equally favorable, but far more detailed, are the results of the Eight-Year Study sponsored by the Progressive Education Association (1).

Morale—Resulting from the present emergency, a number of articles are being published relating to the problem of morale. The *American Journal of Sociology* devoted its November 1941 number to this subject, and the *Psychological Bulletin* its June 1941 number. Few of the studies reported, however, have a direct bearing on educational problems. British psychologists (18, 21, 44), who have studied the effects of evacuation of school children to avoid air raids, found that though the problem is complicated by many factors, the disturbance is often not much less for those children who have been evacuated than for those who remained behind. Educators will need to contend with problems of adult morale as well, for which a penetrating analysis by Allport and others (2) based on a study of ninety life histories of the Nazi revolution should prove enlightening.

Personality

Studies of various aspects of personality are many and often related to educational problems. Schettler (78) listed topical summaries of 308 items on personality traits. The recurring problem of what the personality tests measure was discussed by Bernreuter (12), who recommended that reference be made to Buros's *Mental Measurements Yearbook*, while Super (87) reviewed the research on the Bernreuter *Personality Inventory*. Brogden (15) ran a factor analysis of forty character tests and discovered Spearman's G and W, honesty, persistence, self-control, and acceptance of the moral code. With a revision of the A-S reaction study for women (76), favorable results were reported: negligible correlations with intelligence, around .35 between submission and introversion, and .44 between ascendance and persistence. Projective methods (27, 88) are gaining headway with the gradual secularization of psychoanalytic approaches and the promotion of the Rorschach technic (49). Pearson (66) called attention to a neglected aspect of experience, that of the effect of operative procedures on the emotional life of the child.

Investigations employing the Allport Vernon *Study of Values* and other instruments of evaluative attitude were reported by Duffy (25). Researches on what they refer to as emotionalized attitudes were reviewed by Briggs and others (13) who made their selection on the basis of what they considered would be of most interest and value to teachers. A novel attempt by the use of a modified Likert technic was made by Dexter (22) to measure changes in attitude produced by speakers; and rather striking differences in maturity of attitudes and interests of pre- and post-menarcheal girls of the same chronological age and social status were found by Stone and Barker (82). Probably the most intensive and far-reaching study of interests is being made by Sheviakov (81) and his collaborators; the use of interest questionnaires as a disguised form of personality inventory has possibilities of great significance. Evidence was cited by Super (86) to support the view that avocations are manifestations of dominant interests that do not find expression in vocations. When the regular vocation provides the needed satisfactions, there is no competition with the avocation for an individual's interests and energies.

Behavior Variables of Educational Significance

A number of phenomena of human personality have been investigated. One that has received considerable attention derives from Dembo's concept of the level of aspiration, studies of which have been made by Frank (26). It has been shown (20) that a knowledge of performance of other groups influences the level before firsthand experience with the task but not afterwards. Also, subjects (37) tended to estimate their expected performance too low if the task was easy and too high if it was difficult. This tendency to estimate toward the mean of the group is difficult to explain since the estimates were given privately. Still more difficult is the problem of what to do with the pupils who aspire unsuccessfully to the social norm (80).

Frustration phenomena have likewise begun to attract experimental notice, especially since the Yale psychologists (23) linked them with aggression by a dogmatism they have since relaxed somewhat, perhaps in part because of the excellent analysis by Britt and Janus (14). Anthropological data, puzzles, removal of the bottle, puzzle boxes, memory span apparatus, and many other means have been employed to obtain observable frustration behavior, chiefly in children. While the phenomena stop short of the experimentally induced neuroses in rats and other subhuman species, they nevertheless strongly resemble problem behavior in school, a fact that is not without significance for teaching. The most ingenious and detailed experimental studies are those of Lewin and his associates, especially the frustration-aggression series produced under autocratic social climates (53), and the regression in constructiveness produced in a children's play situation (8).

A number of behavior variables deserve more study than they have yet received. Superstitiousness, for example, in child or adult is as valid an indictment of the school program as illiteracy. Ter Keurst (89) and others have found many hangovers of animism and supernaturalism, to say nothing of tenacious beliefs in obsolete tenets of antique science. In the sensory-motor sphere, clumsiness has been tentatively analyzed by Pear (65), and in the area of social relationships, gratitude by Baumgarten-Tramer (11).

In the generally neglected field of the sentiments Barry (9) found a high incidence of maternal bereavements during childhood in the case histories of over five hundred young psychotics. This problem is scarcely recognized by the schools, while nostalgia, though a problem chiefly to boarding schools, has a fairly extensive literature (58). Jealousy and envy, which often present the most difficult problems not only among pupils but also among teachers, were studied by Ankles (6) by means of an interview technic.

The nature of status is coming to acquire greater significance as a practical and theoretical problem. Writing from the sociometric angle Zeleny (103) defined it as the average intensity of the attitudes expressed toward a person by his associates, and cited evidence to show that it can be measured and controlled. Lippitt (56) approached the question by studying popularity, using the method of paired comparisons and observing social interactions, and found that children's and teachers' estimates were based on different criteria, the teachers', for example, being related to social participation. What Dudycha (24) called "dependability," which consisted in promptness of college students in meeting appointments, coming to an eight-o'clock class, handing in assignments, and returning books to the library, was found to have no relationship to Bernreuter traits or, except for library dependability, to college grades.

Persistence (77), Thornton (95) found to correlate lower than the usual (.45) with scholastic achievement and he contended that the higher figure is spurious. Burton (19) demonstrated with preschool children a reinforcement of persistence after satiation in a pegboard task through social stimulation. These factors and many others are related to leadership, though different qualities are necessary for leadership in different situations. Hunter and Jordan (41) compared eighty-two college leaders with a control group and found them to be lighter in weight, younger, and higher in intelligence, scholarship, and interest maturity, and so forth. It is doubtful, however, if these differences, though statistically reliable, are as significant as others that their technic did not reveal.

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CHAPTER VIII

Visual Aids in Education

JAMES S. KINDER

IN SPITE OF THE FACT that this is the first systematic presentation of visual literature for the REVIEW, it is not possible to do more than sketch in briefest form the history of the development of this field. Emphasis is reserved for the more significant researches of the last three years. Visual education is one of the most rapidly developing aspects of teaching. The term is used to identify representational and experiential materials and technics, which in one way or another are used in every effective school to clarify and intensify the learner's mental images of the object, process, or event being studied. Visual aids have been used by classroom teachers for generations; some forms, however, are relatively new.

The present review is too restricted in scope to classify all the researches done in this field, because these aids include such media as blackboards; bulletin boards; cameras; cartoons; demonstrations; excursions or field trips; films (silent and sound); filmstrips; graphs, charts, and diagrams; illustrations; maps and globes; microslides and microphotographs; models, specimens, and representations; museum materials; opaque projection; slides; and stereographs. In the literature for this field, one finds the terms "audio-visual" and "visual-sensory" as often as the term "visual" alone. To avoid what appears to some educators as a confusion of terms, Hollinger (33) suggested that the designation "perceptual aids to learning" be substituted. Thomas (67) used the same terminology. Hollinger stressed the need for emphasis on the meaning, place, and importance of the "percept" in all learning.

Two decades ago research in visual education centered around the studies of Freeman and his colleagues, Weber, Sumstine, and others. At that time research in this field was rare. Today the literature is replete with discussion articles, surveys, and careful experimental researches. *The Educational Screen* is a journal "devoted exclusively to the visual area in education." *The Visual Review* published annually presents a general summary and survey of visual development. *Scholastic*, a national weekly designed chiefly for secondary schools, devotes one section to audio-visual news. Such magazines as *The Journal of Educational Sociology* and *Education* devote one or more issues each year exclusively to this area. Practically all the educational journals carry numerous articles from time to time on visual education. Many other articles appear in the journals of the various state education associations. Textbooks, pamphlets, conference proceedings, and news letters increase the volume of material.

Many school experiences are sterile and barren. Purely vicarious and verbalistic learning of facts is not consistent with modern theories of education. Even after years of hard study the learner is somewhat like the contemporary of Emily Dickinson, of whom she wrote, "He has all the facts but not the phosphorescence of learning." The motion picture, particularly the sound motion picture, has brought a resurgence of interest in visual aids to a field that previously was rather drab and undifferentiated. The motion picture and the radio have proved to be exceptionally effective adjuncts to teaching. They give vivid and lasting impressions; detailed concepts; broad, interesting, and stimulating experiences; and variety. Half a score of years ago educators were asking, "Why visual aids?" Today the question is, "How can we use visual aids most effectively?"

Technics in Using Visual Aids

Visual education is not a subject nor is it a distinct method such as the project method, the socialized recitation, the unit plan, or the lecture-demonstration. It is a procedure which deals with visual materials. It is, therefore, supplementary to other methods much as the library and laboratory are supplementary. All these procedures, however, have their own technics for optimum results.

Lake (40) maintained that motion pictures should be previewed by the teacher before they are used in a learning unit; film ideas should be adjusted to the purpose of the lesson; there should be specific preparation of the class to receive the film; before and after the film showing there should be time allowed for related class activity; and there should be a definite "check-up" of the ideas which the pupils got from the film. Dickter (19), as a result of extended experience with visual aids at the junior high-school level, agreed with Lake, but added that teachers and pupils should use an evaluation form of some kind for purpose of future record. Dickter listed errors, or "don'ts," for the teacher as follows: (a) showing two or more unrelated films during the same period, (b) failing to have pupils know specifically the purpose of the film, (c) asking very general questions to start the discussion after a film showing, (d) showing the film at the wrong time, (e) failing to use the film a sufficient number of times, (f) reading extensively to the pupils from the teacher's manual which accompanies the film, (g) using films not sufficiently related to the unit under study, and (h) using a film when some other aid would have served better.

In a carefully controlled experiment with eight hundred eighth- and ninth-grade science students, Krasker (39) got at the heart of many troublesome problems of film usage. He found that size of class affects the learning even though films are used. (Small classes—exact size not stated—were better than large classes. Doubtless, much of this was due to the fact that better learning attitudes prevail in smaller classes.) Preparation for showing the film is essential. Classes should not be marched off to the auditorium for the film showing. The Michigan yearbook (48) stressed much the same points.

No instance of scientific research has come to the present reviewer's attention which has shown a loss in amount of learning by pupils when taught through the use of visual media. Stadtlander (66), Hansen (25), Kirkpatrick (38), Wise (76), Lamoreaux (41), Krasker (39), Bradley (10), Reitze (57), and others showed definitely that visual aids are a distinct asset to effective teaching. Also, researches show that this statement holds for all, or practically all, curriculum subjects. A few representative studies here are: in English—Ginsburg (23), Spilde (65), Holland and Netterville (32), Hart (27); in nature study and geography—Stadtlander (66), Peters (53), Repass (58), McLeese (45); in history and social studies—Wise (76), Eichel (21), Walters and Noel (71), Bradley (10); in reading—Winchell (74) emphasized the value of the flashmeter and other types of visual aids, and Berg (8) achieved excellent results with retarded readers with the use of the filmstrip; in science—McCowen (44), Maneval (46), Molyneaux (50), Bennett (7).

Other Uses of Visual Aids

Most of the foregoing studies dealt with factual learning of the classroom type. Ramseyer (54) investigated the effect of the documentary film on social attitudes. Using students from the sixth grade through college and noncollege adults, he showed changed attitudes produced by motion pictures. Social awareness can be materially stepped-up. Furthermore, the changes wrought prevail after a period of two months.

Appreciation—Educators and critics have been concerned over what appears to be a low caste motion picture appreciation. Efforts are now being made in the schools to cultivate a high type of appreciation and a body of critical-minded theater-goers. Dale's work (15) has been significant in this area. Scores of classroom teachers and principals, among them Williams (72), Allensworth (2), and Smith (63), have produced fine results. Motion picture and photoplay appreciation clubs and classes are numerous.

Picture production—Recently many schools have produced scenarios and motion pictures. In some cases this is merely activity of a spectacular type designed to impress the parents, taxpayers, or professional colleagues. In other cases, however, the making of films has a real purpose. It stimulates creative pupil activity and creates worthwhile learning situations. Hart and Wenger (29) stressed the fact that education which does not result in doing or acting is of little value. Health and safety rules must be translated into action. The Denver schools made a notable contribution to school-made films. Livermon (42) showed conclusively that much originality in acting, writing, designing, and directing is provided by school-produced films.

Public relations—Administrators see in visual aids not only valuable educational tools but also implements for the cultivation of better public relations. Here is an effective way of "selling" the school, or ever increasing budgets, to the taxpayers. Martin (47) feels that the motion picture is a modern, dignified, and impressive way of letting the public know what the school is doing. Wagner (70) made a careful survey study of the school-made film for public relations in Ohio. Thirty-eight districts in Ohio had used such a procedure, filming such topics as a typical day in the school, football, safety, May Day, teacher selection, community aspects, and public service. He showed that the school-made film has more audience drawing power than other school-community meetings. Some schools reported that attendance at such meetings in their districts had doubled. Comments and reactions of the school patrons were highly complimentary, hence Wagner concluded that school-made films "should be a part of every balanced and continuous public relations program."

Equipment

Numerous short articles dealing with equipment or surveying the equipment now found in schools have appeared from time to time. One significant reference has appeared over the last three years. The Society of Motion Picture Engineers in 1941 published a report of its Committee on Non-Theatrical Equipment (64), which is a most reliable and usable study. The Society gave pertinent suggestions concerning technical specifications, defining performance of 16-mm. projectors, and the typical characteristics of various types of screens.

School Journey

School journeys, excursions, or field trips are old technics in the teacher's repertoire. In the last decade they seem to have taken on new meaning. The Pennsylvania State Department of Public Instruction contributed materially to their development through the publication of two pamphlets (51, 52). A bulletin of the elementary principals of Los Angeles (43) provided further emphasis. The trips of Lincoln School, Teachers College, Columbia University, have been given much publicity. One of these trips (to the coal fields of West Virginia) was described by Baker (5) and an evaluation and appraisal made by Raths (55). About a year later, thirteen high-school students of Morgantown, West Virginia, made a ten-day trip to New York. Jones (36) provided an excellent evaluation of this field-study experience, showing changes in thought-pattern of the individual students. One high-school principal (59) apparently takes his high-school students on a ten- to twelve-day junket each year covering some three thousand miles or so. This principal is also looking forward to a not too far distant day when his school will offer credit toward graduation for field trips. Selke (61) has not only emphasized the values of trips but has given concern to the standards for judging field trips. The most pretentious and reliable study yet reported in this area was made by Atyeo (4).

Other Visual Media

Although the motion picture is the predominant aid in the visual field, each of the other aids has a specific part to play. No one tool will serve all the educational purposes served by visual education as a whole. Each aid has a more or less specific function. Slides and motion pictures are exceedingly valuable in teaching geography, but Waddle (69) also found the stereograph to be a useful tool in geography teaching.

Science teachers have achieved excellent results with the microscopic projection and microphotographic slide. For purposes of projecting live specimens and bringing interest and reality to the class, these media can scarcely be equalled (73). Breechbill (11), using controlled groups in an elaborate experiment at the University of Maryland, found that experimental groups of science students taught by use of microprojectors showed more uniform learning than control groups with an individual microscope for each pupil. Other results were: in general the pupils seem to prefer the microprojector method; beginning students appear to profit more than advanced students. The results of such an experiment should mean considerable savings in dollars and cents for science equipment. Hall (24) investigated the preferences of 345 high-school students in science for three basic types of illustrations—diagrams, cartoons, and photographs. He concluded that (a) age makes considerable difference in the preferences, (b) high-school seniors prefer diagrams, (c) ninth- and tenth-graders prefer cartoons, and (d) photographs are low in the preference of all groups. Somewhat along this same line, researches in recent years have shown that maps, graphs, and charts as well as pictures need to be taught.

Carthew (13) emphasized teaching such timely maps as are found in newspapers, magazines, almanacs, and the automobile road map. Cobb (14) showed how these are to be used. Wise (75), using controlled technics, showed that, with sixth-graders at least, special training in map reading and study gave greater improvement than incidental methods, and Wrightstone (77) found a gradual growth in map and graph reading ability from the seventh through the twelfth grades.

Abramson (1), Berg (8), and Earley (20) reminded us that the opaque projector, the filmstrip, and the museum still have their contributions to make. Miller (49) has substantiated the findings of earlier investigators in the matter of what children see or do not see in a picture. Children seem to miss many items in nearly every picture, and frequently the items are seen in isolation rather than as parts of a unified whole.

One of the intriguing facts that has grown out of visual education studies is that most visual aids can be used over a much wider scope of grade placements than verbal materials. Using a sound motion picture, Sherman (62) showed that even first-grade children, some of whom had not previously seen a squirrel, learned the concepts of gnawing, balancing, running, climbing, and sniffing the air better than through any other medium.

Rummel (60), using 2,100 children, Grades III through XII, concluded that films have a larger grade area than has been supposed. Stadtlander (66) came to the same conclusion.

Next Steps

The foregoing review is representative of the research and literature in visual education. The field has grown rapidly in recent years. Kinder (37) found that research is being carried on in nearly all the leading institutions of higher learning in some aspect of visual education. Many of these researches are being done in connection with the master's degree, but more and more doctoral work is in evidence. Research divides nearly evenly into administrative and technic problems. Certainly the need for research into unit studies and grade level adaptations has not progressed far. Likewise, such areas as artistic and esthetic judgments, attitudes, and learning processes await much fuller treatment and development. Bean (6) believes that we are on the verge of new and important developments. Hansen (26) and Reed (56) have outlined a fruitful field for investigation. It should also be pointed out that there are many studies, perhaps some of them of restricted range, which need to be done by the teachers in the classroom. These studies, though small in themselves, build the backlog of knowledge for the use of visual aids. This is as necessary as the larger foundation studies.

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CHAPTER IX

Educational Psychology

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DURING THE PAST THREE YEARS investigations in the field of educational psychology were reported under various headings in issues of the REVIEW and elsewhere: teacher personnel, pupil personnel, mental hygiene, exceptional children (35)—perhaps the most significant work in this area being the delineation of endogenous and exogenous feeble-mindedness by Strauss and Werner (84)—growth and development (61), and intelligence (62). During this period the IQ controversy (94) ran rampant with a flutter of varicolored banderillas in its neck defying anyone to administer the *coup de grâce* until the public realized it was witnessing not a struggle in the arena but a tempest in a teacup. Surveys in the REVIEW have likewise appeared, or will appear shortly, on appraisal and on the psychological aspects of the school subjects, where the most prolific work has been in reading (96), though the increase was noteworthy in psychological investigations in the esthetic aspects of learning, particularly in music (79) and in design (100). In this chapter some of the more significant studies in educational psychology are reported following those of the June 1939 issue of the REVIEW, but excluding the areas indicated above. Hence the material treated will relate to the whole school situation rather than to specific school subjects or activities.

The Thought Processes

Conditioning, which came as an answer to the behaviorists' subvocal tensions, has been shown by Hilgard and Marquis (36) and others to be a more complex process than the classical Russian experimentation originally implied. Responses conditioned by different perceptual configurations suggest Gestalt organization (71) and raise the question of equivalence of stimulus patterns (72) that is discussed at length by Hull (39).

Studies of transfer during the preceding six years were reported by Orata (64) who discounts "identity" and favors the more familiar explanatory phrases, "generalization" and the "reconstruction of experience." A so-called generalization method in arithmetic (90), which "emphasized the discovery and use of relationships existing among addition combinations," proved more effective than a drill method in which each combination was "a specific element with no relation to any of the other number facts." The various interpretations that can be given to generalization make it a convenient explanatory principle; but its scientific value, since its famous though elusive launching on the waters of the dart-throwing experiment, is now called into question. An effort to repeat the experiment (33) eventuated in results somewhat less favorable to generalized experience, as such, than those credited to the original reports. Katona (47) emphasized the importance of understanding as contrasted with uncomprehending drill, memorizing, and training, and Brownell (17) showed that the use of a visual "crutch" in subtraction not only did not prove to be a handicap but facilitated the learning of both bright and slow pupils.

The concept of set is apparently due for a revival since Dashiel called attention to it as a neglected fourth dimension in psychology. Though it is variously defined and often ambiguously used (29), it turns up in configural conditioning experiments (70), and in investigations of the law of effect, in one of which (99) the effect did not operate when the "learning motive" was not present, in an experiment that was disguised as one in extra-sensory perception.

In one learning study (48) the value of supervision was tested when teacher effectiveness was equated on the basis of pupil performance and reliable differences were found in subsequent pupil improvement in favor of a supervised over an unsupervised group. In another (73), the dangers of standardized testing were pointed out when high-school pupils, after a six weeks' introduction to chemistry and twenty days of intensive drill on factual material, scored better on the cooperative test than pupils who had spent a year on the subject. A series of studies by Rubin-Rabson (75), in the psychology of memorizing piano music, found little difference in the effectiveness of different methods except for the apparent value of prestudy periods. Stroud (85) reviewed the literature on learning in school situations emphasizing those studies which test out the results of laboratory investigations. The theoretical contribution of the year was Hull's "mathematico-deductive study of rote learning" (40).

Razran (69) concluded that verbal conditioning is primarily semantic, that is, that verbal stimuli can be equivalent because of their meaning-content factor. Maier (59) postulated three psychological processes to account for the various ways in which problems are solved: variability, for trial-and-error; equivalence reactions including transfer of training, for that form of concept formation in which some limited aspect of a situation comes to evoke the response; and spontaneous integration or "reasoning," which differs basically from the other two. Herrick (34) concluded that inductive problem-solving is good when it is characterized by the abandonment of wrong hypotheses before they have received a fully logical disproof and by a variety of hypotheses. Persistence in following out one hypothesis bears an inverse relation to the number of alternative possibilities (74).

Influence of the Social Environment

While hereditary influences have a determining influence as shown by studies of identical twins reared apart and of foster children (101), the structure of the social environment is recognized as of tremendous significance in the modification of human personality. Chaotic as is the field of social psychology (46), educational psychology can definitely profit from a better understanding of its data and technics. The most original work, many would agree, is that being done by Lewin (52) who has been employing topology as a geometry to represent behavior as a totality of co-existing facts having the character of a dynamic field. Following the field theory, Lippitt (55), using two children's clubs in which the effects of autocratic and democratic leadership methods were differentiated, was able to clarify many socio-psychological phenomena familiar in the school society. That experimentally-minded teachers may not confuse autocracy with petulant domination and democracy with inefficient *laissez faire*, Pistor (67) has designed a rating blank listing 120 classroom practices that can be used to aid in preparing pupils to participate in a democratic society.

The methods, results, and problems of social research, not only as they affect the school but the wider society as well, have been summarized under the authorship of several leading workers in the field (10). The time sampling technic was effectively employed by Arrington (7), particularly for the study of continuities in children's verbal behavior.

The wider social environment has begun to attract the attention of educational psychologists. E. L. Thorndike's compendious volume (92) and other studies (83, 91, 93) emphasize the continuity of the adjustment process in which the school participates. How important the human social order is in determining the course of development was suggested by way of contrast in the reports on feral children (104) in which it is absent. The objectives sought and means chosen for obtaining the desired ends differ in different cultures. The duty of education in Fascist Germany (38) is to foster adolescent ecstasy; to be Hitler's soldier raises youth to supraindividual exaltation and action and suprahuman, intoxicating conquests. A report (97) of a comparison of the work of the Bremen Institute for Youth Study for 1926-28 and 1939-40 reveals that as a result of the application of principles received from the Führer, the later fourteen-year-old group is better physically, their characters are firmer, they need stricter discipline, but their scholastic showing is not so good.

On the basis of several studies, Furfey (28) pointed out that undesirable culture traits are not changed by attention to the individual alone, but to the area, class, or group. Koshuk (50) reviewed 525 studies, made since 1925, of socio-cultural influences affecting the behavior of young children, indicating research trends; and J. E. Anderson (5) classified the results of typical studies and enumerated the chief factors conditioning social behavior, for example, selective social learning, social experience provided by the environment, equipment, and out-of-school social participation. The teacher's record of socialization within the community as described by Greenhow (31) is not an enviable one.

The school population is definitely influenced by the wider society and also by the home environment (57); and more effective procedures can be employed (30) in modifying the personality characteristics of children by means of a home-training program. But it is within the school society that the widest opportunities are found for improving the social learning program of the younger generation. The world did not have to wait for Miller and Dollard's ingenious experiments with rats (60) to learn that children imitate. Apparently those teachers who have a high degree of person-to-person interaction with pupils are effective as models and are rated high as instructors (16). Positive directions, defined as simple, specific, approving, and unhurried, were shown by Johnson (45) to be superior to those of the negative type for young children. The results of studies of the influence of the nursery school as such, however, are equivocal (42, 98) since so many other influential factors are operating. More specific studies of group interaction can well be made, such for example as that by H. H. Anderson (3) of dominative and integrative behavior.

Evaluation—A distinctive feature of recent developments in educational psychology is the evolution of measurement into evaluation programs. After surveying 129 titles, Orata (63) concluded that evaluation still has a long way to go before it can fully justify its being associated with newer school practices. Yet it is these newer practices that are largely responsible for calling it into being. A two-year study (43, 102) of the so-called activity program in a group of elementary schools in New York City resulted in the conclusion that the activity classes are generally equal or superior to the traditional in intellectual, dynamic, and social performance factors, though there is evidence that they lag behind in certain school subjects, mainly arithmetic and spelling. A survey (68) of the research findings of the last twenty-five years of progressive education reports no loss in academic proficiency and gain in terms of personal and social development. The same favorable results were reported from a restricted study (51) of college performance of a group of students following a freer program of studies in high school when compared with an equated group taking the traditional required subjects. Equally favorable, but far more detailed, are the results of the Eight-Year Study sponsored by the Progressive Education Association (1).

Morale—Resulting from the present emergency, a number of articles are being published relating to the problem of morale. The *American Journal of Sociology* devoted its November 1941 number to this subject, and the *Psychological Bulletin* its June 1941 number. Few of the studies reported, however, have a direct bearing on educational problems. British psychologists (18, 21, 44), who have studied the effects of evacuation of school children to avoid air raids, found that though the problem is complicated by many factors, the disturbance is often not much less for those children who have been evacuated than for those who remained behind. Educators will need to contend with problems of adult morale as well, for which a penetrating analysis by Allport and others (2) based on a study of ninety life histories of the Nazi revolution should prove enlightening.

Personality

Studies of various aspects of personality are many and often related to educational problems. Schettler (78) listed topical summaries of 308 items on personality traits. The recurring problem of what the personality tests measure was discussed by Bernreuter (12), who recommended that reference be made to Buros's *Mental Measurements Yearbook*, while Super (87) reviewed the research on the Bernreuter *Personality Inventory*. Brogden (15) ran a factor analysis of forty character tests and discovered Spearman's G and W, honesty, persistence, self-control, and acceptance of the moral code. With a revision of the A-S reaction study for women (76), favorable results were reported: negligible correlations with intelligence, around .35 between submission and introversion, and .44 between ascendance and persistence. Projective methods (27, 88) are gaining headway with the gradual secularization of psychoanalytic approaches and the promotion of the Rorschach technic (49). Pearson (66) called attention to a neglected aspect of experience, that of the effect of operative procedures on the emotional life of the child.

Investigations employing the Allport Vernon *Study of Values* and other instruments of evaluative attitude were reported by Duffy (25). Researches on what they refer to as emotionalized attitudes were reviewed by Briggs and others (13) who made their selection on the basis of what they considered would be of most interest and value to teachers. A novel attempt by the use of a modified Likert technic was made by Dexter (22) to measure changes in attitude produced by speakers; and rather striking differences in maturity of attitudes and interests of pre- and post-menarcheal girls of the same chronological age and social status were found by Stone and Barker (82). Probably the most intensive and far-reaching study of interests is being made by Sheviakov (81) and his collaborators; the use of interest questionnaires as a disguised form of personality inventory has possibilities of great significance. Evidence was cited by Super (86) to support the view that avocations are manifestations of dominant interests that do not find expression in vocations. When the regular vocation provides the needed satisfactions, there is no competition with the avocation for an individual's interests and energies.

Behavior Variables of Educational Significance

A number of phenomena of human personality have been investigated. One that has received considerable attention derives from Dembo's concept of the level of aspiration, studies of which have been made by Frank (26). It has been shown (20) that a knowledge of performance of other groups influences the level before firsthand experience with the task but not afterwards. Also, subjects (37) tended to estimate their expected performance too low if the task was easy and too high if it was difficult. This tendency to estimate toward the mean of the group is difficult to explain since the estimates were given privately. Still more difficult is the problem of what to do with the pupils who aspire unsuccessfully to the social norm (80).

Frustration phenomena have likewise begun to attract experimental notice, especially since the Yale psychologists (23) linked them with aggression by a dogmatism they have since relaxed somewhat, perhaps in part because of the excellent analysis by Britt and Janus (14). Anthropological data, puzzles, removal of the bottle, puzzle boxes, memory span apparatus, and many other means have been employed to obtain observable frustration behavior, chiefly in children. While the phenomena stop short of the experimentally induced neuroses in rats and other subhuman species, they nevertheless strongly resemble problem behavior in school, a fact that is not without significance for teaching. The most ingenious and detailed experimental studies are those of Lewin and his associates, especially the frustration-aggression series produced under autocratic social climates (53), and the regression in constructiveness produced in a children's play situation (8).

A number of behavior variables deserve more study than they have yet received. Superstitiousness, for example, in child or adult is as valid an indictment of the school program as illiteracy. Ter Keurst (89) and others have found many hangovers of animism and supernaturalism, to say nothing of tenacious beliefs in obsolete tenets of antique science. In the sensory-motor sphere, clumsiness has been tentatively analyzed by Pear (65), and in the area of social relationships, gratitude by Baumgarten-Tramer (11).

In the generally neglected field of the sentiments Barry (9) found a high incidence of maternal bereavements during childhood in the case histories of over five hundred young psychotics. This problem is scarcely recognized by the schools, while nostalgia, though a problem chiefly to boarding schools, has a fairly extensive literature (58). Jealousy and envy, which often present the most difficult problems not only among pupils but also among teachers, were studied by Ankles (6) by means of an interview technic.

The nature of status is coming to acquire greater significance as a practical and theoretical problem. Writing from the sociometric angle Zeleny (103) defined it as the average intensity of the attitudes expressed toward a person by his associates, and cited evidence to show that it can be measured and controlled. Lippitt (56) approached the question by studying popularity, using the method of paired comparisons and observing social interactions, and found that children's and teachers' estimates were based on different criteria, the teachers', for example, being related to social participation. What Dudycha (24) called "dependability," which consisted in promptness of college students in meeting appointments, coming to an eight-o'clock class, handing in assignments, and returning books to the library, was found to have no relationship to Bernreuter traits or, except for library dependability, to college grades.

Persistence (77), Thornton (95) found to correlate lower than the usual (.45) with scholastic achievement and he contended that the higher figure is spurious. Burton (19) demonstrated with preschool children a reinforcement of persistence after satiation in a pegboard task through social stimulation. These factors and many others are related to leadership, though different qualities are necessary for leadership in different situations. Hunter and Jordan (41) compared eighty-two college leaders with a control group and found them to be lighter in weight, younger, and higher in intelligence, scholarship, and interest maturity, and so forth. It is doubtful, however, if these differences, though statistically reliable, are as significant as others that their technic did not reveal.

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FOREWORD

A NUMBER OF THE CHAPTERS of this issue were prepared under somewhat difficult circumstances by workers who are devoting part or all their time to war activities.

This is the third issue of the REVIEW to be devoted exclusively to research techniques and methods. E. F. Lindquist was invited to assume the chairmanship of the committee for this issue, but when he reported that he was giving all his available time to a new testing program and to war duties, the Editorial Board decided to assume responsibility for the planning and administration of the issue as a matter of experiencing at firsthand the work which committees are called upon to do. This is a situation somewhat similar to that surrounding the first issue on this topic when Frank N. Freeman, then chairman of the Editorial Board, assumed the chairmanship of the special issue of February 1934 on "Methods and Technics of Educational Research." That number was published at the end of the first three years of existence of the REVIEW. The second issue devoted to "Methods of Research in Education," December 1939, did not appear till the end of the ninth year of the REVIEW's life. The second cycle of the REVIEW, in other words, did not have any volume summarizing specifically the advances and practices in research methods for that period. There were, however, several chapters which occurred during that period on research methods, distributed among various issues of the REVIEW. These were detailed in the Foreword to the December 1939 issue.

The present issue comes at the end of the fourth cycle of the REVIEW and is concerned with research methods of the past three years. Whereas the December 1939 issue, under the chairmanship of Carter V. Good, was organized into nineteen chapters, the present issue condenses the outline into a smaller number of larger areas. This was done primarily in an effort to reduce the length of the issue. The topic of "appraisal" has been added at the direction of the Editorial Board. As is usually the case with the REVIEW, much good material has had to be sacrificed to keep the length of the issue within bounds, and contributors have foregone the inclusion of many references in their bibliographies which an unlimited printing budget would have permitted.

This issue of the REVIEW concludes the first full experience with the new schedule of topics which was adopted by the Editorial Board at its meetings in 1938 and 1939. This schedule involved the experiment of printing five issues dealing with particular subjectmatter fields or areas, rather than having these several fields treated under an organization which separated each one of them into elementary-school methods, high-school methods, psychology, measurement, and curriculum. The first three cycles of the REVIEW followed the earlier pattern with only minor changes.

The experiment with the new list of topics has seemed, at least for the present, to be satisfactory and the schedule is being continued for the next cycle in substantially the same form. An effort, however, will be made to avoid the double issue which occurred in October 1941. Accordingly, fine arts will be combined with the language arts and appear as the April 1943 issue. A new title, "Education for Work and Citizenship," will replace the title "Social Studies" and will be somewhat broader. Special attention to research on the war and education will be given in the February 1943 issue, which is devoted to "The Social Background of Education"; and later issues also will deal with the war as it impinges upon their several areas.

DOUGLAS E. SCATES
Chairman of the Editorial Board

CHAPTER I

Bibliographical and Documentary Techniques in Education, Psychology, and Social Science

CARTER V. GOOD

THIS CHAPTER is concerned with recent literature on research procedures which depend primarily on the utilization of documentary sources. The topics treated include (a) library guides and tools in education, psychology, and other social sciences; (b) historiography and legal research; and (c) documentary reproduction.

New Library Guides and Tools in Education

Limitations of space permit the listing of only the recently issued guides most helpful to workers. For additional and more detailed information, standard full-size manuals (4, 139, 140, 191, 230) are available. Most notable is Alexander's revision of his general treatise on library aids and procedures in education (4) providing a recent comprehensive presentation. Thorpe's brief guide (207) is useful, although the attempt to cover in annotated fashion the sources for educational research in only 24 pages has resulted in omissions and in some inaccuracies. The guide by Williams and Stevenson (228) is pointed primarily toward the needs of undergraduates but should prove helpful to many graduate students. Extensive individual bibliographies and major summaries of research are treated only in terms of the guides for locating them. Most of the guides which were regularly published before 1936 were summarized earlier by this writer (87) and are not reviewed again here. It should be noted in passing, however, that the chief serial guides at that time are still the principal tools for library work in education, notably, the *Education Index*, the annual U. S. Office of Education *Bibliography of Research Studies in Education* (90), the bibliographies in the *Elementary School Journal* and the *School Review* (which were assembled annually and published as a monograph up to the 1938 references), *Education Abstracts*, and the REVIEW OF EDUCATIONAL RESEARCH itself. The *Readers' Guide to Periodical Literature* and the *International Index to Periodicals* continue to render supplementary service.

A valuable tool for canvassing educational research literature in general and for obtaining overview treatments of various problems is the *Encyclopedia of Educational Research* (138) directed by W. S. Monroe and sponsored by the American Educational Research Association. There are some gaps in the topics covered. The REVIEW OF EDUCATIONAL RESEARCH, also sponsored by the Research Association, is a major guide, providing overviews and bibliographies of research in problem areas. As a rule, it has included fifteen major subdivisions of education within a three-year cycle (as listed recently on the inside back cover). A twelve-year index of the contents of the REVIEW is now in process of preparation. The *Encyclopedia of the Social Sciences* (189) contains some material on education, as do most of the guides cited in the following sections on psychology and other social sciences.

A comprehensive guide from 1910 or earlier to 1935 is the Monroe and Shores catalog of more than 4,000 annotated bibliographies and summaries listed under author and subject in one alphabet. This listing has been kept up to date since 1935 in part by the *Education Index* and also by the *Bibliographic Index* (21). This latter is a quarterly bibliography of bibliographies on a wide range of subjects, including various educational heads. The first number was published in March 1938. A recent, brief bibliography of educational bibliographies was prepared by Brickman (28). The *Dictionary of Education* (3, 82) will be helpful as a means of orientation, especially in clarifying concepts.

Guides to periodicals and serials—"Serials" may be defined as "any publication issued serially or in successive parts more or less regularly" (191). Most of the tools already cited relate to periodicals or serials. A number of general lists of serials, not necessarily educational, should be noted. The Ayer list (15) is a bibliography of newspapers and periodicals but includes much additional information. The Gregory union list of serials (92) shows the extent to which more than 75,000 different serials are found in 225 of the most important libraries in the United States and Canada. Ulrich's list of 10,200 titles (208) represents the periodicals published in the United States and in foreign countries, especially those of England, France, and Germany, that have proved most useful in American collections. Lyle (131) has grouped his classified list of periodicals for the college library by academic fields of study. For more detailed information concerning use of the guides to serials, the reader is referred to selected sources (2, 4, 14, 234). These references contain tabulations of the years covered by the various indexes to the literature.

Guides to educational books and monographs—The *Education Index* is still the most useful guide to books and monographs in education. *School and Society* has continued its publication of an annual classified list of educational books, monographs, yearbooks, and bulletins, with a selected list of sixty books marked with an asterisk (221). The titles of the sixty books of the year also appear in the April number of the *Journal of the National Education Association* (114). The *United States Catalog* is kept up to date by the monthly *Cumulative Book Index*, which cumulates at irregular intervals during the year, annually into a supplement, and after several years into a large supplement. Each entry includes information concerning author, title, edition, date, publisher, price, and paging. In a sense, the *Publishers' Weekly* supplements the monthly *Cumulative Book Index*, in that it describes and indexes new books in a convenient reference and buying list. Selected bibliographies of books, such as the *A.L.A. Catalog* and supplements, are helpful. For volumes later than 1936, *The Booklist* provides semimonthly selections and evaluations of books. The *Book Review Digest* offers guidance in the evaluation of some 4,000 books during the course of a year. Detailed bibliographical references for these publications have been given earlier (87) and will not be repeated. Bridges (29) listed two hundred series of professional books, bulletins, and monographs in education published since 1900.

Guides to graduate theses—The comprehensive guide to masters' and doctors' theses in education continues to be the annual *Bibliography of Research Studies in Education* (90) of the U. S. Office of Education. Beginning with the titles of 1912, the Library of Congress printed an annual volume of published doctors' theses in all fields; this ceased publication with the theses of 1938 (211). Because this publication was usually two years late and omitted unpublished theses, another agency began a complete annual listing (61) with the titles of 1933-34, and since the year 1938, has been alone in carrying forward this work. Doctors' theses under way in education have been listed annually, beginning with 1931, in the January *Journal of Educational Research* (83). Reference may be made to an annual summary (85) of doctors' theses in school law, with a list of masters' theses in the same field, and to an annual listing (65) of the recipients of doctors' degrees in modern foreign languages.

Many institutions now publish abstract volumes or lists of their theses, usually representing all the graduate work of the particular university but sometimes devoted to summaries or lists of the theses in education alone. A basic guide (156) to such summaries and lists of theses is available. An older source (60) also may prove helpful. The annual *Bibliography of Research Studies in Education* (90) lists such institutional summaries under the heading of "Research, educational—reports." The *Education Index* offers similar guidance under the topics of: "Dissertations, academic"; "Abstracts, educational"; "Degrees, academic"; "Degrees, doctors'"; and "Degrees, masters'."

Special educational areas and problems—In addition to the guides described above and the serial bibliographies in the following paragraph, special aids prepared to facilitate canvassing of the literature of a limited educational area and published since 1935 are school administration (35), school law (59, 99), teacher training (126), adult education (19), testing (195), philosophy (161), business education (93, 215), physical and health education (78), handicapped children (127), nursing education (97), industrial arts (89), rural education (53), Negro education (167), Boy Scouts (133), and publications of the U. S. Office of Education (214). Yearbooks dealing with mental measurements (36, 37, 38, 39, 40), and with research and statistical methodology (41, 42), enable the student and research worker to keep in touch with current developments in these fields. Dictionaries of statistical terms (123), measurement and guidance (194), occupational titles (210), and philosophy (16, 181) provide orientation for interpretation of the concepts represented.

Serial bibliographies and summaries in limited areas of education—Many of the previously described comprehensive guides to the literature are in effect continuing bibliographies. There are also serial bibliographies or summaries of research for a number of specifically limited subdivisions of education. Most such references are annual in their appearance and have continued over a number of years. As a rule, the bibliography of summary for a particular year refers the reader to the earlier numbers in the series. Selected topics represented in the bibliography of this chapter are educational books of the year (222), major educational projects and large-scale investigations (84, 188), deliberative committee reports (43), methods of research (99), teacher supply and demand (71), junior college (70), courses of study and curriculum materials (32), curriculum making (125), reading (91), science teaching (58), modern language teaching (205), physical education (2), and Negro education (119, 120, 166).

Bibliographical, institutional, organization, and statistical directories in education—A number of handbooks of information and directories include biographical facts concerning individuals or statistical or personnel data for institutions. Among the overlapping illustrative references of this type are those dealing with leaders in education (46, 225), specialists in philosophy (226), college and university presidents (171), public and private schools (158), universities and colleges (132), special resources in 765 libraries (218), school supplies and equipment (187), educational buildings and grounds (10), individual professional organizations (5, 33, 190, 223), and registration statistics of higher education (218). The most widely used educational directory (212) probably is that issued annually in four parts by the U. S. Office of Education: I. State and County School Officers, II. City School Officers, III. Colleges and Universities, and IV. Educational Associations and Directors. The educational and social directories and yearbooks for 1942 listed in Part IV of this Office of Education publication (213) number eighty-one. If publications are issued by the educational and learned associations, such journals, yearbooks, or proceedings are named. The general biographical directories—*Who's Who in America, Who's Who,* and the *International Who's Who* (109)—include a considerable number of educators. The *Directory of American Scholars* (44) includes a large number of professors, though not mainly in departments of education.

Guides to Psychological Literature and Data

Many of the educational guides cover a considerable amount of psychological research. In fact, there are certain areas where it is difficult, if not impossible, to draw a sharp line between the two disciplines; for example, learning and conditioning, personality and character, vocational guidance, mental tests, or childhood and adolescence. Therefore, for selected topics the student of psychology may find pertinent information in the previously described educational guides, including the *Encyclopedia of Educational Research, Education Index,* and REVIEW OF EDUCATIONAL RESEARCH. There may be times when the student may find it desirable to use the guides for all the several areas (education, psychology, and social science) discussed in this chapter in working out a single problem.

The major comprehensive guide to the literature of psychology is the monthly journal *Psychological Abstracts* (172) founded in 1927. An author and subject index to the abstracts printed during each year is issued as an extra number each December. The *Psychological Index* (174), established in 1895, suspended publication in 1936. From 1927 to 1936 the two journals performed an overlapping service. As the titles of the publications indicate, one includes abstracts or brief summaries while the other is merely an index or list of references. For publications prior to 1927 the *Psychological Index* is the only major comprehensive guide available. Both of these publications cover periodical literature, books, monographs, and published theses.

A list of topics in psychology should prove useful in identifying appropriate headings for canvassing psychological materials (95). A handbook of the literature of psychology (130) and a compilation of available bibliographies (129) are valuable for the periods represented. In certain large areas of psychology extensive summaries and guides have been provided: general experimental psychology (144), social psychology (145), and child psychology (143). The monthly *Psychological Bulletin* (173) usually publishes one or more critical surveys of the literature dealing with a specific psychological problem. Psychology is well equipped with dictionaries (16, 74, 75, 105, 220), which perform an orientation function in the interpretation of psychological terms, concepts, principles, and procedures.

Biographical directories in psychology—Two volumes of the *Psychological Register* (147), a biographical and bibliographical directory of American and foreign psychologists, appeared in 1929 and 1932, respectively. The 1932 volume included 2,400 psychologists from forty countries. A projected first volume is to include psychologists who had died before the inauguration of the series, extending back as far as the Greek scholars. For more recent information, the yearbook of the American Psychological Association may be consulted, although this annual publication includes only the name, training, position, field of instruction, and major research interests of each individual. The 1942 yearbook lists 713 members and 2,518 associates. *American Men of Science* (45) contains the biographies of a number of the more eminent psychologists. Many of the previously listed educational and general directories include information concerning certain psychologists, especially those engaged in teaching educational psychology or serving in administrative positions. The three-volume *History of Psychology in Autobiography* (146) consists of extended résumés of the lives and works of selected psychologists, most of whom are living.

Guides to Literature and Data in Other Social Sciences

Certain of the general educational guides described earlier in this chapter contain considerable material of interest to workers in other areas of the social sciences. This statement is especially applicable to the *Encyclopedia of Educational Research,* the *Education Index,* the REVIEW OF EDUCATIONAL RESEARCH, the *Bibliographic Index,* and also the annual methodological summary in the September issue of the *Journal of Educational Research.*

The basic reference tool for the social sciences in general is the fifteen-volume *Encyclopedia of the Social Sciences* (189), covering the fields of anthropology, economics, education, history, law, philosophy, political science, psychology, social work, sociology, and statistics. Its purpose is to provide a synopsis of progress in these areas and a repository of facts and principles. It includes biographical articles and bibliographies.

The *London Bibliography of the Social Sciences* (128) is a valuable compilation of some 6,000,000 entries, arranged alphabetically by subject with an author index, and based on the holdings of nine London libraries. *Public Affairs Information Service* (175) is a comprehensive index of periodicals, books, pamphlets, and other materials, particularly those with emphasis on sociology, economics, and political science. It is published weekly and cumulates five times a year and annually. *Social Science Abstracts* promised to solve the indexing and abstracting problems of the social science subjects but could finance itself for only four years, 1929-32. The result is four volumes plus an index. Much of the pamphlet material indexed in the *Vertical File Service Catalog* (216) is pertinent to the social science fields. Much social science material is indexed in the general periodical guides.

The titles of certain journals dealing with the social science fields may be located in the sources described in the section on guides in education. The index volume of *Social Science Abstracts* contains a long list of the journals represented. The yearbook of the Educational Press Association of America includes the titles of the social science journals of most interest to workers in education.

Other useful tools in the social sciences are a compilation (115) of research guides and references and a bibliography (57) on methods of research. The comprehensive guides to published books and to theses described in the section on education may be used for canvassing such materials in the social sciences. In addition, certain continuing or serial guides to theses in sociology and in history are published annually: doctors' and masters' studies under way in sociology (8), graduate degrees conferred in sociology (8a), and doctorate dissertations in progress in history (6).

Guides to special areas and problems of the social sciences—Especially extensive guides have been prepared for certain subdivisions of the social sciences: bibliographies in history (20, 55, 67, 107), dictionaries of American biography (110) and of American history (1), and a guide to materials in political science (34). Dictionaries of terms in sociology (157) and in social work (240) are available. The publications of the University of Chicago faculty in sociology were listed by Wirth (231).

The annual census of social research (24) conducted by the American Sociological Society uses the subheadings of social psychology, history and theory, methods of research, social statistics, social biology, sociology and psychiatry, human ecology, rural sociology, educational sociology, community problems, sociology and social work, the family, sociology of religion, criminology, and political sociology.

Social science directories and yearbooks—The social sciences are well equipped with directories and statistical and current events yearbooks. The annual educational directory published by the Office of Education includes a useful list of educational and social directories and yearbooks, as well as a compilation of educational, civic, and learned associations in the United States. A more extensive handbook (149) lists the scientific and technical organizations of both this country and Canada. Two surveys (80, 153) of organized research in the social sciences are now out-of-date but may prove useful for certain purposes.

There are directories of social work agencies (193), political leaders and programs (163), and municipal officers and activities (141, 142). The social sciences are well represented in the new *Biographical Directory of American Scholars* (44). Four of the widely used annual handbooks of information are the *World Almanac* (236), *Statesman's Yearbook* (197), *American Yearbook* (11), and *Statistical Abstract of the United States* (209). Four of the better known encyclopedias publish annual supplements (12, 30, 151, 237).

The biographical directories listed earlier in this chapter include many of the leading workers in the various social science fields. The *Encyclopedia of the Social Sciences* and the *Dictionary of American Biography* contain much biographical information concerning the workers in these fields.

Developments in Historiography

Education, like most fields of research, has depended primarily on publications in history for knowledge concerning the historical method of research, including techniques for exploration of sources, criticism of documents, and interpretation. The guides to the historical literature have been listed in the preceding section concerned with social science guides. The purpose of this discussion of historiography is to review briefly the major writings on the historical method as a research approach, rather than to deal with studies of the content of history as such. Research in the history of education and in comparative education has been summarized in other numbers of the REVIEW (50, 68), while the historiography of three years ago was characterized briefly in the December 1939 issue of the REVIEW (88).

The two-volume work by Thompson (206), published in the fall of 1942, is the most comprehensive review of historical writing in print, covering the period from earliest antiquity to the outbreak of the First World War, although no living historian is included and by intent no American writer is mentioned. In surveying the changing conceptions of history and the various fashions of writing it, Thompson fitted each author into the general intellectual background of the age represented and assigned to each writer his place in the development of the contemporary historiography. Barnes, in a single volume (17), appears to have been the first to attempt a history of historical writing for substantially the entire period of recorded knowledge, with the result that parts of his book read like a roll call of historians or a running bibliography. However, Barnes's plan of characterizing the intellectual background of each major period, of showing how the historical literature of each era is related to its parent culture, of indicating the dominant traits of such historical writing, and of identifying the individual contributions of the chief writers of each period has definite advantages by way of synthesis over individual literary essays on a group of historians or over any encyclopedic bibliography of historical writing. Shotwell (192) dealt with early records and evaluated in detail the contributions of Jewish, Greek, Roman, and Christian historical writings. Shotwell has planned a second volume to cover the period from early Christian times to the present.

A number of other histories of history cover more limited areas. Kraus (121) provided the first survey of the whole field of American historical writing. Three recent volumes of essays in historiography, written by former students of particular institutions, are significant: two series in American historiography (81, 106) and one dealing with selected historians of modern Europe (186).

Among the recent manuals directed chiefly toward the needs of beginners in historical writing, Nevins' *Gateway to History* (150) is especially comprehensive, with a multitude of interesting illustrations drawn largely from American history and biography. Kent (117) offered advice to the undergraduate senior and beginning graduate student in history in an attractive, forceful style. Good's briefer analysis (86) of selected problems of historical criticism, interpretation, and writing synthesized points of view and examples from a considerable number of full-size treatises in historiography. Other fairly general discussions of the writing of history are those by Hulme (104), Kellett (116), Oman (154), and Taylor (203).

Varied approaches, philosophies, and interpretative concepts in historical writing are represented in the literature of historiography during recent years. Among the more comprehensive treatments are discussions of history or the historical method in relation to biography (111), culture (185, 219), economic forces (98, 124), liberty (56), materialism (77, 94), science (135, 182), social science (168), and theory and philosophy (155, 205).

Space permits mention of only the more extensive applications of the historical method during approximately the past decade to psychology and social science. Dunlap (66) characterized a large number of historical treatises (old and new) in psychology under the headings of topical surveys, surveys of periods, and expositions of the views of particular men or groups, source books, biography, and general histories of psychology. Selected, comprehensive histories of psychology are those by Boring (23), Flugel (79), Murchison (146), Murphy (148), and Spearman (196). Within the past few years histories have been written for several areas of the social sciences: anthropology (159), economics (112), social thought (18, 73), and sociology (103).

This brief review of the literature of historiography suggests the possibility of yet another step in historical writing—"a history of the histories of historical writing." In the course of human affairs events have transpired, then records of events have appeared, next the history based on such documents, considerably later the discussions of historical method or historiography, and recently the histories of historical writing.

Summaries of Legal Research

Legal research in education is a special application of the historical method. The documentary sources utilized are (a) statutory law (constitutional provisions and legislative or statutory enactments) and (b) case or common law (principles applied by the courts in deciding issues not covered by statutory law). Legal research shares with the historical method in general similar techniques for exploration of the sources, criticism of documents, and interpretation.

During the past three years, 1940-41-42, the annual *Yearbook of School Law* (54) has continued as the outstanding publication in this field, with its contents devoted primarily to a narrative topical summary of decisions of the higher courts in all states of the United States in cases involving school law, as reported during the preceding year. This yearbook also summarizes the current doctors' theses in school law and lists the masters' theses in this area. Chambers (48) has tabulated the frequencies of doctors' theses on legal aspects of education in terms of the thirty-three sponsoring institutions and by years from 1919 to 1939 inclusive.

The major textbook publication in educational law for the three-year period is the volume by Hamilton and Mort (96), which is a combined textbook and casebook directed especially toward the problems of educational administration. Chambers (47) has extended the 1936 volume, *The Colleges and the Courts* (72), by reviewing the judicial decisions regarding higher education in the United States from 1936 through 1940.

During recent years the policy of the REVIEW OF EDUCATIONAL RESEARCH has been to discuss the legal aspects of an educational problem in the issue where other phases of the same problem are considered, rather than to devote a separate number of the journal exclusively to school law. Within the past three years parts of certain numbers of the REVIEW have dealt with the legal phases of school organization and administration (179), finance and business administration (49), planning and constructing school buildings (31), the status of teachers (221), and research literature (53).

Documentary Reproduction

Microphotography within the past decade has become the major method of reproducing research materials and has brought about for the historian a revolution in methods of work second in importance only to the development of printing (76). The recency of the development of the several techniques of documentary reproduction, especially microphotography or microcopying, is indicated by the appearance in 1936 of Binkley's manual (22), which is the first detailed account of the various modern methods of reproducing research materials. In a sense, this manual is the parent of the *Journal of Documentary Reproduction* (113), since one reason for founding the journal in 1938 was to continue and keep up to date Binkley's pioneer work. Parts of the manual have been superseded by later and briefer publications but it is still the only basic reference volume for the subjects covered. Developments of 1936 and 1937 are covered in the two volumes (176, 177) that report the papers presented as microphotography symposia at the 1936 and 1937 conferences of the American Library Association.

There are four major uses (27, 122, 170, 201) of microphotography in furthering the work of scholars and research workers:

1. Negatives of materials not available in local libraries or in any single library may be made in many distant places and combined into a complete collection or series; for example, a newspaper or journal series or some other periodical collection.
2. Materials from distant libraries that cannot be visited, particularly collections in foreign countries, can be reproduced for local use.
3. Original publication of research, such as doctoral dissertations, is possible. University Microfilms publishes at intervals a volume of abstracts (134) of doctoral theses that are available in complete form on microfilm. Power (169) has outlined the problems and procedures involved in publication of theses by microfilm. Paul Monroe's work (136, 137) on the history of education combines the process of printing (Volume I, the textbook) and microfilm (Volume II, a collection of readings from the documents and source materials referred to in the textbook).
4. Preservation of documents that face disintegration, destruction, or damage through the ravages of time, wear, fire, or war. The space saved in the case of bulky materials, such as newspapers, is considerable; a filmed volume on a newspaper occupies approximately one-fiftieth of the space of the original.

The rapidity with which the work of microcopying has progressed is evidenced by the new *Union List of Microfilms* (160), which includes 5,221 items. The editorial committee in charge of this list hopes to issue annual supplements to keep the compilation up to date. Descriptions of the microcopying projects of individual libraries or organizations are available in the literature (76, 118, 201). Stewart (200) outlined fifteen problems to be solved together with recommendations for improving the uses of microphotography for scholarly purposes.

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CHAPTER II

Analytic, Synthetic, and Diagnostic Studies of Individuals[1]

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METHODS OF STUDYING PERSONALITY have far broader applications today than ever before. They are essential to effective war effort and to the implementation of democratic principles. Prediction is necessary in the placement of personnel in the military services and in the selection of personnel in government and industry. In the problems of postwar reconstruction a knowledge of the unique contribution each person can make will be basic to the effective functioning of a democratic society.

Theories of personality may either be derived from novel variations in methodology, or they may dictate the methods of study employed in a given research. In the former instance, new light may be thrown on the structure and organization of personality; in the latter instance, the theory may be extended or clarified. Various theories of personality are represented in the publications of the last three years, but the most significant advances have been in the direction of study of the inner organization and the uniqueness of personality.

Persistence and Limitations of Paper-and-Pencil Tests

In his 1940 review of trends in clinical procedures and psychotherapy, Watson (80) noted the marked decline in interest in paper-and-pencil personality tests. Yet in spite of the skepticism regarding these instruments as repeatedly expressed by clinical workers, the experimental evidence of their lack of validity, and the arguments against this method of assessing personality as summarized by Vernon (79), new inventories and scales are still being devised, each with some unique and commendable feature.[2] Although the paper-and-pencil tests have some value as screening devices for detecting maladjustment in groups, as approaches to the interview, and as a basis for clinical study of individual responses and patterns of responses, interest in these instruments is being supplanted in recent literature by more enlightening and more valid approaches.

New Uses of Familiar Instruments

The use of definitely structured material such as standardized tests has certain qualitative possibilities. These qualitative aspects are emphasized in the administration of the Bellevue-Wechsler intelligence test (81). For example, the way in which a subject defines the words on the vocabulary test tells a good deal about the "quality and character of his thought processes," his cultural milieu, and schizophrenic tendencies. Observation of a subject at work on the object assembly test reveals something about his thinking and working habits, ability to work toward an unknown goal, persistence in completing a task, and sometimes artistic and mechanical ability. Porteus (64) recognized similar possibilities in the maze tests, offering as they do relatively great latitude of response to the subject and thus providing "particularly fertile material for some aspects of personality diagnosis." Gerlach (27) made a contribution to methodology in her comparison between psychometric pattern as indicated by the Stanford-Binet and Cornell-Coxe quotients and asocial and aggressive personality types as found in case histories.

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[1] The author is indebted to Margaret McKim for assistance in locating and reviewing references in the section on "Diagnosis of Difficulty in School Subjects."

[2] See Chapters VI and VII of this issue of the REVIEW for further discussions of means of assessing various human traits or abilities.

Another example of new uses of old tests for personality diagnosis is the new scoring keys for the Strong Vocational Interest Blank. Tussing (78) reported that the validities of the keys in the areas of home, health, and emotional adjustment were low, but that self-confidence and sociability could be predicted fairly accurately by this method. Sheviakov's work (72) is another example of the clinical treatment of a psychometric technique. Instead of merely taking the items on the interest test at their face value, Sheviakov grouped and studied the responses in various ways and was able to construct an apparently valid personality picture of each subject. The diagnosis of personality through a study of the relationships between tests or parts of tests and through attention to the qualitative aspects of a person's responses is a promising development, probably stimulated by the success of the clinical treatment of subjects' responses to unstructured situations.

Personal Documents and Self-Analysis

The most important contribution in this area is the historical survey and evaluation of the critical literature and experimental studies made by Allport (3).

> The personal document may be defined as any self-revealing record that intentionally or unintentionally yields information regarding the structure, dynamics, and functioning of the author's mental life. (3, xii)

There are various forms of "first-person human documents" ranging from personal accounts, with no checks or technical aspects, to critical and experimental studies. Included in this category are autobiographies, questionnaire responses, verbatim recordings, diaries, letters, and expressive and projective documents. Allport found personal documents useful in research, in teaching, in the construction of questionnaires and typologies, and in social psychology. In comparing the advantages of personal documents with their disadvantages he found most of the latter irrelevant or trivial.

A high point in the intentionally revealing personal document is represented by the self-analysis of "Clare" reported by Horney (39). In this case the procedure by which a patient may not only let her thoughts, feelings, and impulses emerge, but also use her critical intelligence in their interpretation, is minutely described. Such a document reveals the "why" of behavior as the patient sees it in her effort to effect a better adjustment. The value of such a self-analysis for research on the springs of conduct is obvious.

New Emphases in Observation

The technique of observation was so comprehensively reviewed by Jersild in the December 1939 issue of the REVIEW that little need be added here about this important instrument of scientific research. Perhaps the chief developments during the past three years have been its application on the college level, whereas formerly the vast majority of investigations were in the preschool field; and more use of the method as part of a unified approach to the study of the individual as a whole. Jarvie and Ellingson (41) described in detail, with many examples, the recording of behavior and the interpreting and implementing of the "anecdotal behavior journal" in their institution. McCormick (53) concluded from his experience with anecdotal records in the secondary schools of Springfield, Missouri, that this form of observation "has proved to be a feasible and useful technique" in the public school. An example of the clinical diagnostic use of observation was described by Brown (13) who used an experimental situation in which to observe the reactions of psychiatric patients to thwarting. He found a continuum of reactions which suggested to Watson (80) a possible "objective analysis of psychoses which are now measured only with adjectives like 'mild' and 'severe.'"

The most pervasive use of observation during this three-year period was reported by Lerner and Murphy (51). In their research observation was the basic method not only in natural nursery-school situations, during the intelligence testing and the pediatric examination and with the music teacher, but also in a variety of experimental situations. The emphasis in all these observations was on the "how" and the "why" of behavior. Every activity carried on in the nursery school was considered as an opportunity "to understand what it must feel like to be this 3- or 4-year-old, and . . . to help children to be their most effective selves" (51: 247).

Single-Aspect Approaches

The approach to personality through a single aspect might be called the "flower-in-the-crannied-wall" technique. It is true that an individual's pattern of personality may be revealed through his handwriting, his gait and other expressive movements, his speech (70), his free associations (30), and his sense of security (69).

The biological basis of personality and the chemical substratum must also be recognized. "Certainly all individuals cannot respond similarly to exactly the same experiences. This fact in itself demands analysis and explanation" (73). Kahn (46) advocated an endocrine examination to determine whether a flyer's symptoms of tenseness and nervousness, insomnia, and psychomotor tension are due to maladjusted endocrines or to hereditary structural and physiological weakness of the nervous system. Methods and instruments used in studying anatomical, biochemical, physiological, and medical aspects of adolescent development are described in detail by Greulich (32).

The "Interpersonal Relations" Approach

The definition of personality as a person's "social stimulus value" naturally leads to a methodology involving classmates' or associates' opinions or ratings. Using a modified form of the "guess who" technique, Tryon (77) was able to make especially enlightening sketches of individual children who received extremes of scores derived from classmates' opinions. Jennings (42) advocated the study not only of "the individual's emotional-social expression choice and rejection of others but similarly the expression of other persons toward him." Bonney (12), Zeleny (84), and many others reported sociometric investigations in *Sociometry* during the past three years. The study of the individual as a social atom throws light on such problems as the choice process and patterns, on the characteristics of persons in isolated or near-isolated positions as contrasted with individuals in leader positions, and the consistency of the "internal structure" of the social atom (42).

Developmental Approaches

The genetic approach to the study of personality need merely be mentioned here because the December 1941 issue of the REVIEW dealt fully with the topic *Growth and Development.* Since changes in structure are closely correlated with changes in function, the clinical study of development makes an important contribution to the study of personality. This point of view is exemplified in *Developmental Diagnosis* by Gesell and Amatruda (28) and by Campbell and Weech (19) in their attempt to arrive at a mathematical description of certain aspects of a child's development against the background furnished by his peers.

The Case Method

Olson's review of the case method in the December 1939 issue of the REVIEW opened up a wide field of usefulness in "the establishment of professional practices and scientific generalizations." His emphasis on the value of case studies for administrative information, for the evaluation of programs, for curriculum and instruction, for illustration and validation of statistical results, and for scientific generalizations was an original and significant contribution.

The three most significant trends are (a) the attempts to standardize and to quantify case studies, (b) the use of case studies in the prediction of personal adjustment, and (c) the application of statistical method to the single case. None of the statistical methods—statistical treatment of each item or factor as an independent unit, partial and multiple correlation, factor analysis, matrix algebra—have been wholly satisfactory. Burgess (17) reviewed four possible procedures: (a) intuitive generalization, (b) analysis of the case in all its individuality, (c) prediction by way of typology, and (d) analysis of the data according to fourteen factors that seemed to be dynamic. After applying the fourth procedure, Burgess questioned "whether a scientific method of analyzing factors will be superior, or even equal to the intuitions of persons gifted with deep understanding of human nature" (17:348).

The use of case studies in the prediction of personal adjustment is most thoroughly reviewed by Horst and collaborators (40), with the conclusion that case study data are definitely relevant for prediction. Stouffer (74) suggested a fusion of the intuitive and the statistical approaches: the intuitive selection of variates or configurations which the investigator thinks important in an individual and the comparison of this dynamic configuration with that of other individuals whose success or failure is known or with time-sequence records of success and failure within the individual case. The study of cases, according to Cottrell (20), "is aimed at isolating syndromes and typical personality patterns which experience has shown to be correlated with certain resulting behavior, problems in adjustment, success or failure in some activity" (20:369). The study of cases involves the three steps of synthesis, genesis, and prediction: (a) how one views his life situations; (b) how one came to have such a point of view; and (c) what one's attitudes and overt responses are most likely to be under specified circumstances.

The use of prediction as an approach to the study of personality as a whole was suggested some years ago by Barbara Burks and facetiously called the "He Would" technique. More recently F. H. Allport and Frederiksen (1) applied this method with college students as experimenters and subjects. Their predictions of responses which acquaintances would make to a verbal dilemma were only slightly better than chance, but would probably have been much higher if "the teleonomic pattern had been successfully predicted."

The application of statistical methods to the single case introduces "a new conception of a 'population' for statistics—a population of events and traits within the boundaries of one person" (3). By dividing material on an individual case into incidents which are then classified according to object discussed and attitude expressed, Baldwin (4) built the structure of an individual's personality pattern which agreed closely with clinical judgments of the original material.

Projective Methods

The materials of projective methods present to the subject a stimulus-situation which is unfamiliar or "unstructured"; in responding to this situation he reveals the way in which he organizes experience, and thereby the skilful investigator gains insight into the subjects' "*private world* of meanings, significances, patterns and feelings" (25). This is the essence of the various projective techniques. They constitute the chief method thus far evolved of studying the individual as a dynamic whole. The most widely used of these techniques is the Rorschach test. A great increase in interest in the Rorschach test has been evident during the last three years. The *Rorschach Research Exchange* has been active in disseminating experience and mutual criticism and the *American Journal of Orthopsychiatry* has published numerous articles on technical aspects of the Rorschach test. Two books, both containing extensive bibliographies, have recently been published giving details of administration, scoring, and interpretation. Klopfer and McGlashan (48) gave detail comparable to the Terman and Merrill manual for measuring intelligence and is an indispensable handbook for beginners. Bochner and Halpern (11) likewise presented the Rorschach test as a method of personality diagnosis and included helpful case records and protocols obtained from different types of persons. Continued research is needed on interrelations within a given individual response which help to identify brain injury, schizophrenia, and functioning intelligence; on the validation of the Rorschach method by "blind" interpretations and by comparisons with psychiatric case studies; on factors in personality on which the Rorschach method can be expected to give evidence; and on sources of errors in the Rorschach test (5). A recent development, stimulated by war needs, is the modification of the Rorschach method for use as a group test (34). Another important development is the increasing use of projective techniques as part of a comprehensive study of individuals.

Synthesis of Data from Comprehensive Sources

The culmination of fused theory and methodology is found in research in which significant data are collected by a variety of appropriate methods —psychoanalytic and projective as well as psychometric, developmental as well as cross-sectional, social case work, medical, observational, and the recording of the physical and psychological environment—and these data are synthesized into a structural personality pattern with "manifold roots and manifold effects."

Several major investigations have developed a methodology in the field of personality research along these synthetic and comprehensive lines. The Macfarlane "guidance study" (56) is making a unique contribution in the procedure of analysis of developmental material within each group of data and in the interrelations among different kinds of data. The Adolescent Growth Study reported by Jones (45) is another outstanding many-aspect developmental study of personality with more than usual attention to biological factors.

The adolescent study reported by Brown and other members of the Adolescent Study Staff (14) is exceptional in its being conducted under public-school conditions and in its ingenious charts for synthesizing information about individual pupils—their goals and purposes, their social relationships, and the interaction among different aspects of their development.

Burks (18) described in detail her method of studying "identical twins reared apart under differing types of family relationships"—a method which "seems to offer promise of shedding some light upon the nature of traits themselves: their focal character, their variable modes of expression and their developmental transformations."

This research is an excellent example of insightful analysis and synthesis of comprehensive data by means of which "trait organization" or "focus" within the individual may be studied.

Although the Harvard Psychological Clinic's *Explorations in Personality* (36) was published a year previous to the limits set for this review, the reader should be reminded that this research represents the most thorough application of previously developed, and of original, subjective methods to the study of the personality of college students that has yet been made. It is the best single source of theoretical interpretation of the dynamic, unified approach to the study of "really significant congruences in personality."

On the preschool level a similar approach has been made by Lerner and Murphy (51). This research is exceptional not only in the development of new projective techniques for use with young children, but especially in the interpretation of the children's responses and in the focusing of observation on the "why" of their behavior. The experimenters attempted to organize the detailed records into a descriptive picture and to formulate hypotheses concerning the child's temperament and "foci of emotional drive in terms of conflict, hostility, longing, guilt, pleasure, etc." The hypotheses were then checked in terms of repeated evidence from the experiment itself, from subsequent experiments, by information from adults, and by further observation and experiments designed to test the hypotheses.

It is especially significant that this synthetic, comprehensive approach is being used in the selection of army officers in England and in Germany. The examination, according to an article in the *London Times* in June 1942, lasts for two days and includes not only the administration of individual tests, but also observation of conduct and attitude in a number of practical situations. The life history is considered important and emphasis is placed on qualitative aspects in the study of the total personality.

Diagnosis of Difficulty in School Subjects

The trend toward a comprehensive synthetic approach to the study of the individual, as already noted, is perceptible in the diagnosis of difficulty in school subjects. Olson (61), in his longitudinal growth studies of school children, presented reading as an integral part of total growth and cited instances of reading development as an aspect of the growth of the child as a whole. The same concept of reading as "a function of the total growth of the child" was emphasized in the report of the third annual Conference on Reading sponsored by the University of Chicago and edited by W. S. Gray (31). Witty (82) likewise has been a vigorous advocate of the study of the whole individual as a basis for dealing with reading difficulties. His list of diagnostic procedures is therefore extensive: results of standardized tests, sensory and physiological functions, the interest inventory, diagnostic checklist of pupil's reading, observations of pupil and home, trait rating scale and reading evaluation, physical and medical data, and home information report. These should yield a wealth of information for an insightful analysis. The *Examiner's Diagnostic Reading Record for High School and College* (76) serves as both a guide to reading diagnosis and a convenient form for summarizing the breadth of information considered of diagnostic value.

The concept of reading patterns has not yet been as generally recognized as the concept of personality patterns. A recent research (75) represents a transition from the statistical analysis of masses of data to the insightful synthesis of case material in the field of reading. The case studies obtained in this investigation focused attention specifically on reading interests and responses and the reading case workers employed a procedure "somewhere between the standardized reading-test procedure and the flexible social or psychiatric case study method" (75:5). This combination of the interview and tests provided for observation by the examiner and some introspection by the subject as well as quantitative measures of reading speed, comprehension, and interests.

Much more emphasis has been placed on the use of tests than on the whole-child or reading pattern approach for diagnostic purposes. The readiness or prognosis test to detect weaknesses and to indicate teaching emphases necessary to prevent failure has been developed in both the fields of reading and arithmetic. According to Breuckner (16):

> . . . the most important function of readiness tests in both reading and arithmetic is not *prediction* of success in the primary grades or at any other grade, but the *diagnosis* of factors likely to interfere with learning at any level of the school, at any stage of development, or in the study of any particular process or topic in the curriculum.

Other tests of broad and important reading abilities have practical diagnostic value. The test of critical thinking in the social studies designed for Grades IV, V, and VI by Wrightstone (83), the test of critical reading with reference to problem solving in the intermediate grades developed by Gans (26), the test of reading social studies materials in the high school by Martin (57), and of the reading of elementary algebra by McKim (55), both of the last two tests being based on typical reading demands made by their respective subjects—these are examples of tests of decided value in the diagnosing of reading difficulties.

Analysis of errors has long been a common method of diagnosing difficulty in arithmetic and reading. Bennett (6) analyzed 34,274 errors made by retarded readers in the recognition and pronunciation of 237 basic words in a contest. She pointed out that errors do not occur in a haphazard way. Further advances in individual diagnosis through the analysis of errors may be made by studying patterns of errors and relating these to other factors such as conditions under which certain combinations of errors occur.

Other approaches to the diagnosis of reading difficulties are through the study of separate factors: vision (62), visual fatigue (23), eye-movements (29), level of aspiration (38), "organized comparisons between meanings" (66), mental ability (59), and reading interests and experiences (63).

Details of diagnostic procedures are supplied by the report by Hildreth and Wright (37) of the remedial reading class of eighteen pupils, by Preston's (65) case histories of forty pupils referred for remedial work after one to nine years of failure in reading, and by Durrell in his book *Improvement of Basic Reading Abilities* (24).

One of the most valuable diagnostic procedures in spelling is to ascertain a child's grade level on accepted spelling lists. Betts (7) provided such a list of 8,645 words for Grades II to VIII, giving the median grade placement, frequency in seventeen spellers, and grade range for each. Another spelling scale was published in the same year by Bixler (8). This contains a list of 3,679 words with tables indicating the percentage of pupils who can spell each word at each grade level from II to VIII.

It has been disappointing that more attention has not been given to the diagnosis of process such as Brownell (15) developed in arithmetic and Joseph Dewey in reading. Such diagnosis requires direct observation on the part of the investigator and introspection or verbalization on the part of the child. In this way the mental processes which lead to correct or to incorrect solutions can be ascertained. Two children may have the same score on a reading test but their reading ability may be quite different because of differences in their methods of work. In the individual testing situation these different patterns of methods of work may be diagnosed, for the examiner can ask the subject to explain how he solved the problems or did the tasks.

Significant Developments in Methodology of Studying Individuals

Among the most significant developments in methodology are:

1. The inclusion of additional sources of data in the study of an individual—the environmental setting, the situations in which responses are made, more use of unstructured and experimental material, observations directed toward the "why" of behavior and social interaction, and the increased use of personal documents.

2. Increased use of the genetic approach beginning with the young child and working forward rather than beginning with a maladjustment and working backward.

3. "Insightful" analysis and synthesis into a unitary structure of the comprehensive data collected.

4. The search for persistent, pervasive trends in personality that manifest themselves in specific behavior and are allied to conation, purpose, striving.

5. The cautious approach to any quantitative analysis of personality, with the recognition that the attempt at standardization may "disrupt dynamic patterns."

6. The attempt to predict from case study material.

7. The formulation of hypotheses concerning human personality from the study of individual cases, recognizing that although the single case does not discover a law, it does discover that there is a law, and that therefore the individual case has research importance.

8. The clearer recognition that appraisals of personality reflect the personality and training of the investigator and that the psychologist must therefore "himself become an instrument of precision."

9. There are individual differences in subjects with respect to their response to different methods, which may make one approach more appropriate for one person than for another person.

These trends represent progress in the study of the uniqueness of personality and in the diagnosis of maladjustment. They might well be applied to a greater extent in the diagnosis of difficulties in school subjects. Each trend implies a criticism as well as a commendation of the present status of diagnostic studies of individuals.

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CHAPTER III

Survey and Trend Studies

DAVID SEGEL

THIS CHAPTER is concerned with studies involving mass data which represent conditions or trends. The treatment is divided into (a) school surveys—state, city, and community; (b) large-scale testing programs; and (c) studies of language.

General problems of methodology in making status and trend studies are discussed by Segel (30) and by the Committee on Educational Research at the University of Minnesota (21).

Sears (28) pointed out that the survey is not itself a definite research technique but is rather the over-all interpretation and synthesis of facts discovered through more detailed research techniques. In considering the methodology of the school survey, two aspects should be emphasized: one is the application of new techniques found to be useful in gathering data in surveys, and the other is the general approach to the problem and the synthesis of the results. A survey properly conceived and executed is the most comprehensive and at the same time the most valuable of all research undertakings, because it deals with the broad aspects of actual field (or life) situations.

State School Surveys

The Regents' Inquiry into the Character and Cost of Public Education in the State of New York (1, 6, 10, 11, 17, 20, 25, 26, 32, 33, 39, 40, 41) set up first of all a general objective: to discover any failure of the New York State school system to meet the needs of youth. This general objective was broken down into workable units of inquiry, such as the needs of youth in occupational, civic, or recreational areas.

The survey did not stop with examining directly the school program, as is customary in school surveys, but also examined the effect of the school on former students and on the out-of-school activities of students. Two thousand former students of the high schools of the state of New York were interviewed regarding their major problems, attitude toward their present jobs, source of any advice received in regard to vocations, reading activities, club activities, movie attendance, training being received on the job, and hobbies. The information obtained from the employees was concerned with the initiative shown and other evidence of satisfactory work. The data were considered in relation to the curriculums that the young people had followed while in school. Through this type of analysis there was a definite attempt to correlate the conditions of school environment with adjustment in later life.

This survey exemplifies the following desirable steps:

1. Setting up objectives of the survey.
2. Determining the types of investigation which will secure data bearing on the objectives of the survey.
3. Gathering primary data through whatever instruments are most pertinent. This step involves the investigation of the school and its program, and also of the product of the school.
4. Synthesis: studying the interrelationships of various data gathered.
5. Formulation of conclusions regarding needed changes in the school system.

Another type of state survey is the study by Mort and Cornell (23). This study dealt with the adaptation of school practices to changing needs in nine phases of work. Critical innovations were the kindergarten, reorganized high schools, special classes, homemaking for boys, adult leisure classes, extracurriculum activities, elimination of final examinations, integrated curriculums, and supplementary reading. The degree to which these practices existed in the schools of Pennsylvania at different points of time were studied through questionnaires sent to all first-, second-, and third-class school districts, and a one-tenth random sample of the fourth-class districts of the state. The growth throughout the state in each adaptation was traced.

An interesting part of this report is a supplement describing the research methods used in the study. "The authors have attempted to avoid limitations of particular techniques, methods, and points of view, and have moved forward in their study with an effort to make use of such tools as best served the field. In our own minds, we feel that we have avoided the pitfall of being drawn into polarization of point of view with reference to the whole and the part method, the mass descriptive approach versus the limited case study upon carefully isolated factors, or the statistical versus the non-quantification approaches. . . . We realized that along with methods of well-established utility we have employed some of doubtful or uncertain reliability and validity. All this was done with the purpose in mind of utilizing all tools at hand toward the end of examining a very intricate and dynamic complex, the process of adaptation" (p. 435-36).

City School Surveys

Both the St. Louis (35) and the Pittsburgh (36) surveys established new trends in city surveys through the use of several new techniques in getting at civic and social growth in school children. In the St. Louis survey, for example, several of the newer tests of social and civic competence were given. An important comparison was that made between the scores on these tests and the number of semesters of work in the various social studies that the pupils had taken. Among the instruments used for this purpose were *Judgments Characteristic of the Socially Competent Person; Test of Critical Thinking in the Social Studies; What Do You Think? Ordon Social Science Test;* and the *Melbo Social Science Survey Test.*

An important change in the use of measurement in city surveys is illustrated by the Pittsburgh survey. Tests of achievement in subject fields such as reading, arithmetic, and English, were not given in the survey, because the Research Division of the city schools had data from such tests available in its files which were used by the survey staff. This survey took an important step by investigating the extent to which test results were used by the schools to individualize instruction and provide individual guidance. A school survey should not only determine general levels of competence but also see if the schools are using all the facilities possible to determine individual differences and adapt their instruction and guidance accordingly. An excellent analysis of the research procedures of the St. Louis survey has been made by Caswell (3).

Surveys are using new techniques of evaluation but still suffer by the general practice of uncontrolled observation of classroom work. Comprehensive school surveys should take advantage of the new instruments of general evaluation being evolved for secondary and elementary education, such as those developed by the Cooperative Study of Secondary School Standards and those developed in the Research Division of the state department of education of New York.

The Columbus, Ohio, survey of health and physical education activities (12) is an excellent example of a survey of an important area of a school's activities. A new method of getting at the mental health of students was tried, thru employing the following criteria:

1. The child is considered a chronological misfit if his age differs from the median age of his classroom group by more than one year.
2. A child is regarded as an intellectual misfit if his mental age is more than one year below or more than two years above the median for his own classroom.
3. A child is regarded as an academic misfit if his reading achievement is more than one year below or more than two years above the median of his classroom.
4. A child has a reading disability if his reading age is more than one year below his mental age.
5. A child is regarded as a school failure if he is repeating his grade (or half-grade).
6. A child is regarded as a truant if he has been a truant from school during the current term.
7. A child is regarded as a behavior or personality problem if he rates low on one of the better behavior rating devices, or the *Personal Index,* or the *California Personality Test.*

In order to be considered as a mental hygiene case the child must have failed in two or more of these criteria.

Community (Sociological) Surveys

In community, or sociological, surveys as contrasted with educational surveys, the problem of adequate sampling looms large. This is true because it is more difficult to sample adequately a miscellaneous group of people, such as those in a town or rural area, than it is to study pupils already classified by ages and grades in school.

Jenkins (14) discussed this problem in connection with his study of the growth and decline of agricultural villages. His definition of an agricultural village is a town between 250 and 2,500 in population, situated in a farm area, and largely dependent on the farming population for its continued existence. Since there are approximately 7,000 villages of all types in this population range in the United States it would be an almost impossible task to study all the agricultural villages. Jenkins chose for his study the villages used originally by the Institute for Social and Religious Research in 1924. These villages were selected by first making a rough count of the number of agricultural villages, thus giving the proportion of villages to be selected from each state or region. Within each area villages to be included in the study were selected by sociologists and others familiar with the area. Since the sample used was set up in 1924 a question was raised as to its representativeness in 1938 or 1939.

Terry and Sims made a cross-section study (37) of all aspects of a rural community. The study is largely a detailed and intimate description of the life of the community. Whereas in most social studies people are interviewed and documentary evidence is examined, in this survey the surveyors actually participated in the life of the community. The community was made to feel that the visitors were interested in what the community was interested. The writer feels that this method might properly be called the "life sample" method since the investigators lived short samples of time as persons in the community. As an illustration the investigation of the religious life of the community may be mentioned. The surveyor attended meetings as a visitor-participant. The church activities were in no case cramped by the pressure of the visitor. The surveyor sang the songs and took part in the services in the same way as any cousin or uncle visiting in the community would do.

Frederick and Geyer made a community survey at Battle Creek (8). The American Council on Education published a guide to community surveys (4).

Regional Testing Programs

Testing programs over wide geographical areas are carried on in a variety of ways and purposes. Some programs use general ability tests with high-school freshmen; more often the program consists of achievement testing for such purposes as motivation of better scholarship or teaching, evaluation of the curriculum, or to provide diagnostic measures for use in remedial instruction. A new emphasis on the guidance aspect of such testing programs is found in the new Iowa undertaking (19). This is based on the two following general objectives:

> 1. To enable teachers, administrators, and counselors to keep themselves more intimately and reliably acquainted with the continuing educational development of each individual pupil, in order that instruction and guidance may be better adapted to his peculiar and changing interests, needs, and abilities; and
>
> 2. To provide the school administrator with a more dependable and objective basis for the over-all evaluation of the total educational offering of the school, in order that any need for curriculum revision may more surely be brought to his attention, and that his supervisory efforts may be more wisely distributed.

The testing program set up to satisfy these two objectives would, according to the reasoning of the Iowa plan, be one which has the following characteristics:

1. The tests used should measure as directly as possible the attainment of the ultimate objectives of the entire school program.
2. All the tests should be administered, under standard conditions, to the entire student body.
3. The program must provide for the measurement of growth. This means that the tests should provide for periodic measurements with the same or with comparable tests.
4. The tests used should measure the more permanent changes produced in the pupils. For this reason it is planned to give the Iowa tests at the beginning of the year since no cramming can take place for such examinations and since it is after a summer vacation that permanent results of instruction show up best.
5. The test results should not be usable in the rating of individual teachers. Since the tests are given at the beginning of the year the results cannot be used to check on the efficiency of instruction of particular teachers or classes.
6. The test results should be available in a readily interpretable form. This means that scores from the various tests can easily be compared through comparable scores or through graphical profiles.
7. The measures derived must be highly comparable from test to test.
8. Each of the tests used must yield highly reliable measures of the abilities of the individual pupil.

The instruments devised for the testing in Iowa cover the following fundamental abilities of pupils in the secondary school: (a) the understanding of basic social concepts, (b) the ability to do quantitative thinking, (c) the ability to write correctly, (d) proficiency in the natural sciences, (e) the ability to interpret reading materials in the social studies, (f) the ability to interpret reading materials in the natural sciences, (g) the ability to read literary materials, (h) the ability to use important sources of information, and (i) the ability to recognize important word meanings.

The Illinois 1941 State Testing Program (7) was a cooperative program sponsored by the high schools and colleges of the state of Illinois to aid high schools in the guidance of seniors and colleges in their admission program. The American Psychological Examination and a special reading test constructed by the Board of Examiners of the University of Chicago were used.

Both the Iowa and Illinois State Testing Programs are voluntary. An important aspect of both programs is the provision made for mechanical scoring at a central point. This is important because a tabulation of the scores is necessary before norms can be made available.

The purpose of state department testing programs has been mainly accrediting of schools or promotion of pupils to higher institutions. There has been a tendency to get away from such purposes because the type of testing encouraged—testing specific subjectmatter as laid down in state courses of study—was not to be commended. An example of a new emphasis is that shown by the Examination Division of the state of New

York. In that state there is being gradually introduced a new system of tests based on fundamental abilities, such as reading and mathematics, the scores of which the schools are encouraged to use in instruction and guidance. This development in New York is something like that in Iowa already described.

Age-Grade-Progress Studies

The age-grade survey of Los Angeles County (19) made comparisons of age-grade status for the years 1929, 1933, and 1937. This study compared, in terms of percents, normally placed, over-age, and under-age students for the three years in the nonurban schools of Los Angeles County. The New York City report for the school year 1940-41 (24) included comparative figures of promotion and ages for most of the years 1925 to 1941. Age-grade-progress for 1940-41 was analyzed at length. The state department of education of New York (22) made a study covering the progress of pupils in rural districts from Grade VIII through high school, a period of five years. Some of the broader aspects of the maladjustment between the pupils and the school program were ascertained. This study is a trend study based upon two cross sections made at an interval of five years.

There is a general weakness in statistics gathered about children in that there is little uniformity in the standard set for normal school entrance or for different grades or periods of school life. This mitigates against comparisons of different geographical or political regions. The U. S. Office of Education, through its bulletin on age-grade-progress (31), is encouraging the standardization of age-grade-progress data.

Studies of Language

The study of language has increased considerably during the last few years. In general there appear to be three types of approaches in this field. The first consists of the consideration of the logical basis of language as a carrier of meaning, such as in Carnap's new book (2) and Korzybski's book (16). These authors studied meaning through building up another language to explain the original language. "By a semantical system (for interpreted system), we understand a system of rules formulated in a metalanguage and referring to an object language, of such a kind that the rules determine a truth-condition for every sentence of the object language, i.e., a sufficient and necessary condition for its truth." Carnap has expanded considerably the "metalanguage" suggested by Korzybski and has set up definite rules for using this language in analyzing declarative English statements. The metalanguage is a combination of symbols and English.

Another approach to the study of language is that illustrated by Fries (9) who studied intensively the language found in 3,000 letters of a federal government department. He first classified the writers into three social or class groups in accord with definite information including the education and occupation of the writers and in some cases a special confidential report on the family. The language facts for the three groups of persons were examined for forms of words, the uses of function words, or the uses of word order. Upon the basis of his study, Fries recommended a new type of approach in the teaching of grammar.

The third type of language study is the statistical study of the occurrence of word meaning or of errors of language. Davis (5) noted that in counting errors in oral speech, the amount of such error can only be judged if the relative amount of error can be compared with the amount of correct speech. Davis made this comparison by taking actual transcriptions of the speech of a large number of children. Those interested in word counts should read Thorndike's analysis of word counts (38), which discusses the results of various types of approach. Knott (15) reviewed somewhat the same problem, as did also Seegers (29). Rinsland (27) studied the words from 100,212 separate writings of children in Grades I through VIII. The words were analyzed for the different meanings used. There are two weaknesses in the method: (a) Children hesitate to write words they cannot spell and may therefore leave out words they use orally. (b) The words children use may not necessarily be the words they should use or the words that they should know when reading. Stone (34) studied vocabulary based on children's words and Horn (13) reviewed research on adult vocabularies.

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CHAPTER IV

Experimental and Statistical Studies: Applications of Newer Statistical Techniques[1]

PAUL BLOMMERS and E. F. LINDQUIST

THE LAST FEW YEARS have witnessed a gradual and rather belated introduction into research procedures in education of the many new and in some cases very important statistical techniques that have become available during the past two or three decades. While many of the educational applications of these newer techniques have been valid, not a few have evidenced a faulty understanding of the techniques or a failure to recognize the implications of the theoretical assumptions underlying their derivations. It is the purpose of this chapter to attempt a general appraisal of these applications from the technician's point of view. The chapter has therefore been organized with reference to techniques. Only as many studies have been cited with reference to each technique as were needed to yield illustrations of important prevalent errors and misconceptions, or, occasionally, of valid applications. In some of the studies cited the error may be of relatively minor consequence and in all other respects the study may be very competently conducted.

The treatment is divided into three general, somewhat overlapping areas: problems involving correlation, significance of differences between means, and analysis of variance and covariance.

Significance or Reliability of an Obtained Correlation Coefficient

Newer techniques for testing the significance or reliability of an obtained r have been largely ignored by research workers in education. Four instances were noted in which this application of the Fisher z-transformation was made (6, 12, 33, 55) to test the null hypothesis. While the z-function provides a satisfactory test of this hypothesis, the F-test

$$F = t^2 = \frac{r^2}{1-r^2}(N-2)$$

provides a somewhat more exact and conservative measure of the significance of an obtained r. No such application of the F-test was observed. In a fifth instance (18) the z-transformation was employed to establish the 5 percent-level confidence interval (fiducial limits) for obtained correlation coefficients.

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[1] For other reviews of statistical methods see Chapters VII and VIII of this issue.

Averaging Correlation Coefficients

The Fisher *z*-transformation makes it possible to obtain an improved estimate of the population correlation by pooling estimates of the correlation based on several independent random samples drawn from that population. Four applications of this procedure were encountered (21, 25, 33, 40). For this procedure to be valid the estimates averaged must be based on random samples from the same population (or equally correlated populations). In some instances the technique concerned has been employed without regard to this condition. Rizzo (40) obtained intercorrelations for scores yielded by three different scoring procedures applied to three different tests for each of eight different grade levels. As nearly as could be told from the data presented, at least half of the differences in the intercorrelations thus obtained were significant. Yet Rizzo not only used the *z* technique to pool correlations for different techniques within a given grade-level and for different grade-levels within a given testing technique, but also for all grades and all testing techniques. A similar error was made in the second part of the study. It would appear that Rizzo has incorrectly assumed that the *z* technique permits the averaging of correlation coefficients in general, without regard to possible real differences between them.

McConnell (25) employed the *z*-transformation to average the intercorrelations between scores on the major subjectmatter subdivisions (physics, acoustics and astronomy, and chemistry) of a comprehensive examination in physical science. He also averaged the intercorrelations between the scores on the various "outcome" parts (vocabulary, knowledge of facts and principles, application of facts and principles) of this same examination. This procedure would be valid if one could assume that the correlations averaged were obtained from independent random samples rather than from the same sample, and if one could assume also that these correlations were all estimates of the same value. However, neither of these assumptions seems reasonable and the procedure is open to question.

Lannholm (21) reported strong evidence of real differences from school to school in reliability coefficients and also in validity coefficients for the same test. However, in order that he might obtain a general estimate of reliability and validity for the tests he was studying he made use of the *z*-transformation to average the coefficients for the various schools involved, commenting:

> Since this method of averaging correlation values is not valid if true differences in correlation exist from one school to the other, the use of this procedure may be questionable in this case. Nevertheless, it is believed that the averages thus obtained represent perhaps the best possible estimate of the general validity of each of the different tests (p. 70).

The Significance of a Difference between Correlation Coefficients

The Fisher *z*-transformation was properly applied in a number of studies (3, 26, 29, 48, 52, 58) to test the significance of a difference between correlation coefficients obtained from independent random samples. In some studies, however (4, 13, 25), this test was incorrectly applied to *related* correlation coefficients obtained from the same sample. Edgerton and others (13), for a sample of 288 men, obtained the six correlations between a total liberalism score and separate liberalism scores in democracy, economic relations, labor, race, nationalism, and militarism. The same six correlations were obtained for 149 women. Sex differences in these relationships were then tested by the Fisher z-test. In this application the samples are apparently independent and, if random, the test is valid.

These writers, however, go further. They present 129 correlations for men and state that hence there are 8,256 possible differences in correlation cofficients for men alone. Since it was not feasible to test each of these differences individually, the writers provided a table containing the significance ratios (exceeding 2) for differences between r's based on samples of 288 cases. They then suggest that by means of this table ". . . the reader can estimate the significance of the difference between any correlations which he wishes to compare in this study" (p. 262). Inasmuch as the variables involved are related and all correlation coefficients are derived from the same sample, none of the tests of significance that a reader might choose to make by means of this table would be valid.[2] Even though all these correlation coefficients had been obtained from independent random samples the mass procedure suggested in this study would still not be valid. The fallacy involved in effecting such tests *en masse* may be appreciated by noting that if the 129 correlations were derived from independent random samples drawn from the same population (i. e., all estimates of the same value), some 400 of the 8,256 possible differences between them would be judged "significant" according to this procedure.

Significance of a Difference Involving Spearman-Brown Estimates

Several of the studies cited in the preceding section have been concerned with the validity of the Spearman-Brown formula for predicting reliability coefficients under circumstances somewhat different from those for which this formula was originally intended. Bruce (4), for example, obtained the grade point averages of 209 students who remained in college attendance for twelve consecutive quarters. She estimated the reliability of the grade point averages by correlating those earned by each student in two consecutive quarters. From this r the reliability of grade point averages over n quar-

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[2] A test of the significance of the difference between related correlation coefficients of the type r_{y1} and r_{y2}, both of which have been obtained from the same sample, has been derived by W. G. Cochran. This test, which has never been published, is

$$t = \frac{(r_{y1} - r_{y2})\sqrt{N-3}\,\sqrt{1 + r_{12}}}{\sqrt{2}\,\sqrt{1 - r_{12}^2 - r_{y1}^2 - r_{y2}^2 + 2r_{12}\,r_{y1}\,r_{y2}}}\,, \quad df = N - 3.$$

An equivalent test was independently derived by Hotelling. See H. Hotelling, "The Selection of Variates for Use in Prediction with Some Comments on the General Problem of Nuisance Parameters," *Annals of Mathematical Statistics*, 1940, Vol. 11, pp. 271-83.

ters was predicted by means of the Spearman-Brown formula. Since the data were available for the direct computation of the reliability over n quarters, the *obtained* r for n quarters was compared with the *predicted* r for n quarters by means of the z-test. This application of the z-test is not strictly valid because the *predicted* r and the *obtained* r are not here independent. Bruce was aware of this shortcoming and tried other methods of testing the difference concerned.

Remmers and others (10, 36, 37, 38, 39) have contributed a series of studies concerned with the hypothesis that a multiple-choice test having items with $2r$ responses is twice as long as a test consisting of the same number of r-response multiple-choice items, and that consequently the reliability of the $2r$-response test may be predicted from the r-response test by means of the Spearman-Brown formula. Though the studies in this series are concerned with various types of measuring instruments and vary somewhat in approach, they are similar enough that a few descriptive comments with respect to one of them (10) will suffice for the lot. Denny and Remmers (10) divided some 1,000 high-school pupils into four groups. Each group was given the same 100-item multiple-choice vocabulary test, with the exception that the number of possible responses varied from group to group. That is, the test administered to one group consisted of 5-response items, that administered to a second group consisted of 4-response items, and so forth. For each form of the test the reliability coefficient was computed by the "odds-evens" method involving the use of the Spearman-Brown formula. From each reliability coefficient thus obtained the reliability for each of the other three forms was predicted by employing the Spearman-Brown formula in the manner suggested by the hypothesis being tested. Differences between the predicted and theoretical reliability coefficients were then tested by the z-test. Since the obtained reliability coefficients and the corresponding theoretical coefficients are based on independent samples, the test is valid so far as this consideration is concerned. Strictly, however, the formula for the standard error of z is designed for correlations computed directly from random samples, not for those estimated from obtained correlations by use of the Spearman-Brown or any other formula. It is interesting that in no case was the difference between the z's as large as the standard error of the difference—a result one would hardly expect even though the hypothesis were known to be true.

On the basis of these results the authors wrote, "For vocabulary test items varying in number of responses from two to five it is concluded that the experimental data completely support the hypothesis" (p. 704). If the authors imply that they have *established* the hypothesis, they have violated a fundamental principle of statistical logic. No null hypothesis can be established on the basis of results from random samples. The sample data may be consistent with the null hypothesis and may establish its tenability as an hypothesis, but they do not completely support it. One may not conclude that there is no real difference simply because the obtained difference is not significant.

Intraclass Correlation

Two applications of intraclass correlation techniques were encountered (28, 34), both of which were concerned with the study of twins. Portenier (34) compared twelve pairs of twins with twelve pairs of siblings on a number of personality measures. For each of these measures the intraclass correlations were obtained for the twins and for the siblings. These *r*'s were transformed into *z*'s and the differences between these *z*'s for the twins and the corresponding *z*'s for the siblings were tested for significance. To find the standard error of these *z*'s the author used the formula $\sigma_z = \frac{1}{\sqrt{n-3}}$. This is actually the formula for the standard error of a *z* arising from an interclass *r*, the proper formula for the S.E. of a *z* arising from an intraclass *r* being $\sigma_z = \frac{1}{\sqrt{n-\frac{3}{2}}}$. It should be noted that in using the improper formula Portenier erred on the conservative side. Regarding the reliability of the differences obtained Portenier stated that none of the significance ratios exceeded 2.0, but that if any ratio greater than one is acceptable, certain of the differences are significant. This last standard is approximately equivalent to accepting the 32 percent-level of confidence as a criterion of significance, which is contrary to all practice. The most important point to be noted is that because of the small number of pairs involved (12 pairs) any demonstration of real differences between *z*'s (when 2.0 is taken as the critical value of the significance ratio) requires that the obtained difference be as great as .72. This condition illustrates the futility of attempting to demonstrate the presence of small real differences between correlation coefficients derived from small samples (21a).

Morgan (28) obtained certain measures of eye-movement performance in reading for a sample of artificial twin pairs, a sample of fraternal twin pairs, and a sample of identical twin pairs. The intraclass coefficients of correlation were reported for each of the three types of pairs on each of the measurements taken. The manner of computing the P.E. of the obtained coefficients was not reported and, although the necessary data were given, the writers were unable to duplicate certain of Morgan's reported P.E. values. The P.E. of the distribution of obtained intraclass *r*'s about the true coefficient, ρ, is ordinarily given by $P.E._{\cdot r} = .6745\ \frac{1-\rho^2}{\sqrt{N}}$ when the number in each class is 2 and when *N* is sufficiently large. This formula is limited not only by the fact that it involves a population parameter but also by the fact that the distribution of obtained *r*'s about ρ becomes increasingly skewed as *r* approaches ±1.00. Since some of the *r*'s found were of considerable size, this study illustrates an application of the P.E. which is often virtually meaningless but which unfortunately is common in educational research.

Correlation Coefficients from Relatively Homogeneous Subsets

When a bivariate population is comprised of subpopulations such that the subpopulations are more homogeneous with reference to one or both variables than the total population, and such that the correlation between the variates is the same for all subpopulations, then, on the basis of random samples (groups) drawn from the various subpopulations, a best estimate of the common "within group" correlation may be obtained by the methods of analysis of covariance. Osborn (30) employed this procedure properly to estimate a number of correlation coefficients, such as those between performance on an achievement test and the shift in attitude toward a certain social issue resulting from a propagandizing treatment. His subjects consisted of the members of intact class groups selected from various school systems. On the grounds that attitude toward the issue concerned tends to be less varied within a school community than in the total population of school children, a given school may be regarded as a sample from a relatively homogeneous subpopulation. Hence, Osborn used the formulas of analysis of covariance to obtain the "within class" correlations, thus eliminating from the coefficients whatever effect between-school differences may have had upon them.

Kuder-Richardson Reliability Formulas

The use of the Kuder-Richardson formulas to estimate the reliability of a test is rapidly increasing. Andrus, Cronbach, and Hastings (2, 8, 18) each used the Kuder-Richardson Formula (*20*). Froehlich (16) presented a slightly different form of the Kuder-Richardson Formula (*21*). This particular formula is based in part on the assumption that all the items of the test are of uniform difficulty. Froehlich made a rough empirical check on the cruciality of this assumption by administering the five parts of the *Wisconsin Achievement Test* to 2,000 individuals. He obtained the reliability coefficients for each of the five-part scores and for the total score by both the split-halves procedure and the Kuder-Richardson Formula (*21*). The difficulty of the items on this test ranged 71 points on a 100-point scale with a standard deviation of 16. Yet the differences between the indexes of reliability were relatively slight, the largest difference being .058. Moreover, the two indexes correlated perfectly.

The Kuder-Richardson formulas are based on assumptions which are far from satisfied in any applications which have come to the reviewers' attention, and hence it is difficult to say what it is that the *r*'s thus obtained actually measure. Perhaps what they measure is better described as "internal consistency" than as "reliability," as the latter term has usually been employed. The Kuder-Richardson, the "odds-evens," and the "equivalent forms" techniques do not describe exactly the same characteristic of a test. There is a real need for further clarification of the issues involved in the choice between these techniques.

Testing the Significance of the Difference between Means of Independent Random Samples

Applications of the *t* distribution (students' distribution) to test the significance of the difference between means of independent random samples are becoming increasingly common (1, 6, 14, 15, 27, 32, 35, 54, 57, 59). Pintner (32) made extensive use of the *t*-test in studying the differences between normal hearing and hard-of-hearing individuals of various age groups with respect to certain measures of personality traits. The means which he thus compared were based on independent samples of varying size. On the whole his samples were large, so large in fact that in most instances it was necessary to enter the *t*-table for an infinitely large number of degrees of freedom. As a consequence the traditional procedure[3] would in theory have been somewhat superior to the *t*-test[4] because the latter assumes homogeneity of variance whereas the former does not.

According to Fisher (14a) the value of *t* yielded by the latter test tends sometimes to be increased by a difference in variance between the populations from which the sample is drawn.[5] It would be well to distinguish more clearly between these two tests and between the assumptions underlying their use. The traditional test is generally to be preferred for large samples; for small samples the *t*-test must be used. A particularly serious error is that of employing the traditional procedure with small samples and interpreting the significance ratio thus obtained as though it were the *t* statistic. Wolfe (57), for example, used the traditional procedure in comparing a small group of average readers with a small group of retarded readers with reference to such factors as laterality, audition, vision, verbal association, and adjustment. She interpreted the critical ratios thus obtained as *t*'s, entering the *t*-table for seventeen degrees of freedom. Wolfe dealt with equal sized groups, in which special case the procedures yield identical significance ratios. However, the proper number of degrees of freedom is thirty-four rather than seventeen, since the groups compared each involved eighteen subjects. It is less likely that this error would have occurred had the proper formula for *t* been

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[3] $$S.\,R. = \frac{M_1 - M_2}{\sqrt{\sigma^2_{M_1} + \sigma^2_{M_2}}}, \text{ where } \sigma^2_{M_1} = \frac{\sigma^2_{\text{sample 1}}}{N_1 - 1}$$

[4] $$t = \frac{M_1 - M_2}{\sqrt{\frac{N_1\sigma_1^2 + N_2\sigma_2^2}{N_1 + N_2 - 2} \cdot \frac{N_1 + N_2}{N_1 N_2}}}, \text{ where } \sigma_1^2 = \text{variance of sample 1.}$$

[5] Suppose, for example, that $N_1 = 500$, $N_2 = 1000$, $S_1^2 = 32$, and $S_2^2 = 4$. Here $F = 8.01$ whereas $F_{.01} = 1.19$. With this large difference between both the sample variances and frequencies, the value of *t* based on these samples and for any difference in means will be 1.373 times as great as that of the significance ratio yielded by the traditional procedure. On the other hand if $est\sigma_1^2 = est\sigma_2^2$ the two procedures yield identical results regardless of the difference between N_1 and N_2.

employed. Another instance in which the traditional procedure was employed and interpreted as *t* was found in a study by Vaughn (54). Here again, however, the groups upon which the comparison was based were equal in size and hence the results are valid.

The application of an estimate of error designed for use with independent samples leads to biased results when applied to samples which are not independent. Researchers working with paired samples have generally taken this fact into account. However, it has frequently been ignored by workers dealing with groups which have been equated with respect to some control variable by simply making the means and standard deviations approximately equal for the two groups. Young (59), studying the relative effectiveness of different lengths of practice periods, employed three procedures with reference to four phases of school learning. The twenty-three subjects which comprised each of the three experimental groups were closely matched with respect to age, intelligence, and initial ability in the particular phase of learning being considered. Young stated that the significance of the difference between group means was tested by the *t*-test. Recomputation of the reported probabilities of the *t*'s obtained for various differences between means showed that the *t*-test employed was that designed for use with independent samples. This particular test is not appropriate here.

Testing the Significance of the Difference between Means of Paired Measures

Applications of the *t*-test of the significance of the difference between means of paired measures are not common in the field of education (6, 9, 24, 25, 30). A particularly interesting application of this *t*-test is found in a study by Osborn (30). Osborn sought to determine whether the change in attitude toward a certain social issue was significantly less for individuals who had been taught to be on guard against certain techniques of propaganda. Osborn's subjects were the members of intact classes of school pupils selected from a number of schools. Each school yielded two classes, one of which was used as an experimental or "taught" group and the other of which was used as the control or "untaught" group. Osborn reasoned that, apart from the effects of the experimental treatment, the pupils in a single school would be relatively homogeneous in their attitude toward the issue concerned, and that hence the whole study had to be regarded as a sample of schools rather than as a sample of pupils. His analysis was therefore concerned with class means rather than with individual measures. Since the classes all involved approximately the same number of individuals the unweighted means were used. These means were paired by schools and the difference found for each school. The *t*-test for a difference between means of paired measures was then appropriately used to test the significance of these differences.

Simple Analysis of Variance

So that there may be no confusion in terms, it may be well first to describe briefly what we mean by "simple analysis of variance." Given a set of observations which may be classified into groups, the sum of the squared deviations of all observations from their general mean may be analyzed into two components. One of these is the sum (for all groups) of the squared deviations of the observations from their respective group means, the other is the weighted sum of the squared deviations of the group means from the general mean. Each of these components, divided by the appropriate degrees of freedom, will yield an unbiased estimate of a population variance, on the assumption that all groups were independently drawn at random from equally variable populations. On the further assumption that in these populations the observations are normally distributed, one may use the *F*-ratio between these two estimates of variance to test the hypothesis that the population means are equal. Any instance in which a test of this type is based on an analysis of variance into two components will here be referred to as an instance of "simple" analysis of variance, as distinguished from the more complex case in which the analysis divides into several components.

Stuit and Donnelly (51) compared the scores made four years previously on various aptitude and entrance proficiency tests by individuals graduating from college. In one phase of this study Stuit and Donnelly grouped measures of mathematical aptitude for these individuals into nine groups, according to the major field subsequently pursued, and applied the methods of simple analysis of variance to test the hypothesis that the group means were equal. This analysis was repeated four additional times, once for each of the three other aptitudes or skills measured and once for the composite of the four measures. Except for the fact that the assumption of normality was not satisfied—an assumption which is usually not crucial—this application seems sound.

Edgerton and others (13), Evans and Wren (14), Mellens (26), and Williamson and Bordin (56) employed analysis of variance when correlation techniques would have been more appropriate. Evans and Wren (14) placed 148 students into four groups on the basis of test scores. The grade point averages for these individuals were analyzed so as to yield a "between groups" variance and a "within group" variance. It was found that the mean grade point averages of these groups varied significantly. This study produced quantitative values for both variables, and yet coarse categories were imposed on the data in order to use the methods of analysis of variance. Such data, in general, are more appropriately analyzed by correlation procedures. The scheme of correlation analysis based on the unbiased correlation ratio set forth by Peters and VanVoorhis (31a)—the so-called Epsilon technique—is admirably suited to the analysis of data of this type. The Epsilon technique has the advantage of not only providing a test of significance equivalent to that provided in analysis of variance, but also providing a readily interpretable estimate of the strength of the relationship. Where the assumption of linearity seems justified the ordinary product-moment correlation serves the same purpose.

Part V of the study by Edgerton and others[6] (13) is of interest for another reason also. In one phase of the investigation simple analysis of variance was applied twice to the same data but with different groupings of the subjects. The variable analyzed was "liberalism" as measured by the Progressive Education Association's "A Scale of Beliefs." In one instance the subjects were grouped into six catagories on the basis of the amount of their mothers' education; in the other the original six categories were combined into two coarser categories according to whether the mother did or did not attend college. A significant F was found in the second analysis but not in the first. This procedure is analogous to computing a product-moment r between two variables, and subsequently imposing a dichotomy on one variable and computing a biserial r for the same data. The effect of grouping errors might be to make the biserial r significant and the product-moment r nonsignificant, but the test based on the finer categories would ordinarily be considered the more dependable. For similar reasons the F-test based on the six categories would provide the better test of the null hypothesis in this study, and the test based on two categories seems redundant and pointless.

Lamson (20), by means of analysis of variance, reached interesting and most unexpected conclusions relative to differences between five fourth-grade classes in IQ and in educational age. She concluded that the five classes differed with high significance insofar as mean IQ's were concerned, but that they did not differ significantly insofar as educational age means were concerned. These conclusions resulted from a rather interesting error. In analyzing the IQ measures, Lamson obtained a "within class" variance of 48.92 and a "between classes" variance of 2.56. Obviously, the means of the IQ measures taken jointly do not differ significantly from class to class. The F-test need not, in fact cannot, be made since the variance to be tested (the "between classes" variance) is smaller than the error variance (the "within class" variance). Lamson, nevertheless, determined an F-ratio using the "between classes" variance as the denominator or error term and concluded that: ". . . the variation in IQ is larger than would be expected in similar samplings ninety-nine times out of a hundred as the result of chance factors. The composite group lacks homogeneity with reference to intellectual ability" (p. 177). A conclusion which might validly have been drawn from this F-test applied by Lamson is that some real factor had operated to make the differences between class means considerably smaller than would result by chance.

Only one application of simple analysis of variance to experimental data was encountered in the educational periodicals checked. Lohmeyer and Ojemann (22) were concerned with the relative effectiveness of three methods of auditory presentation. A pre-test was given over the material presented and the three methods groups were equated in part with reference to this measure. This same test was used again as a final or post-treatment test, the criterion measures analyzed being the differences between corresponding pre-test and post-test scores. No allowance was made for the effect of equating groups, hence a simple analysis in this case affords a definitely biased test of the hypothesis that the methods of presentation are equally effective. Since the preliminary measures were available, an analysis of covariance might have provided an unbiased test of this hypothesis.

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[6] Part V was done by W. A. B. Schrader.

The t-Test as Used in Conjunction with an Analysis of Variance or of Covariance

Sometimes, in a simple analysis of variance of a sample consisting of several groups, it is desired to test the significance of the difference between the means of a particular pair of these groups. In general, it is defensible to use the t-test for this purpose only after the F-ratio of the "between groups" and "within groups" variances indicates that taken jointly the group means differ significantly. The research worker should guard against the temptation to apply the t-test to certain pairs of means (particularly those selected because they show a relatively large difference) when the F-test has already shown that the observed variation in the means is entirely attributable to chance. This mistake was made in a study by Rubin-Rabson (42). Long and Welch (23) and Evans and Wren (14) applied the t-test to selected pairs of means before applying the over-all F-test. A valid application of the t-test in such situations may be found in a study by Lohmeyer and Ojemann (22). An example of the t-test properly applied in conjunction with an analysis of covariance may be found in Spencer's study (50) dealing with the retention of orally presented materials.

Complex Applications of Analysis of Variance

The analysis of variance into three components is found in a study by Cast (7), which was concerned with the problem of evaluating different methods of marking themes. Cast submitted forty themes to twelve judges each of whom marked each theme by the same prescribed method. Cast obtained three independent estimates of the population variance, namely, an estimate based on the differences between themes (V_c), an estimate based upon the differences between judges (V_e), and an estimate based on the residual or remaining differences between the 40 x 12 ratings after effects due to themes and judges had been eliminated (V_r). Reasoning, then, that a system of marking which did not differentiate significantly between themes was valueless, Cast concluded that a significant $F = V_c/V_r$ is one of the criteria of a good marking technique. He next reasoned that a good marking system does not differentiate between judges, and hence a significant $F = V_e/V_r$ would be indicative of a poor marking system. Finally Cast reasoned that a good marking system is one which reduces random errors to a minimum, and that, therefore, a significant $F = V_r/V_{total}$, where V_{total} is obtained by dividing the total sums of squares by the total degrees of freedom, would indicate a poor marking system. In this last step he made an error—that of trying to test an F-ratio between variances that are not independent of one another.

Cast repeated this analysis with three other schemes of marking using the same themes and the same judges, a period of approximately two months separating each marking. He ranked the schemes thus studied on the basis of the three F-ratios described—a somewhat questionable procedure in view of the lack of any evidence of the comparability of the F's or of the reliability of the ranking. A similar form of analysis may be found in a study by Sells, Loftus, and Herbert (49).

A study by Owens (31) of intra-individual differences versus inter-individual differences in motor skills illustrates an unusual variety of applications of analysis of variance and other techniques, some of which seem as questionable as they are ingenious and interesting. Owens administered each of six tests of motor skills eight times to each of fifteen individuals, in an effort to determine the relative magnitude of (a) differences from trait to trait within the same individual and (b) differences from individual to individual for the same trait. Among other things, he analyzed the variance (T.V.) of scores obtained from seven administrations of a test of a motor skill into the "between administration" (R.V.), "between individuals" (I.D.), and "remainder" (error) components, and then indicated in terms of percents the contribution of each factor to the total variance. In his Table 1, for instance, he stated that 68 percent of the variance in "block packing" scores is due to differences between individuals, 16 percent to differences between administrations, and 16 percent to error. The contribution of individual differences was apparently obtained by deducting the error mean square from the mean square for individual differences, and dividing the result by the number of individuals. The contribution of administrations was presumably found by deducting the error mean square from the administration mean square and dividing the result by the number of administrations. (Owens does not state specifically what divisor was used.) These contributions were presumably then added to the error mean square and each expressed as a percent of this total. This procedure is commonly used in genetics (49a) to evaluate the contributions of various factors to variance, and may find rather wide applications in education. When based on a small number of categories, however, a percent estimate of this kind is likely to be highly unreliable and should not be interpreted too literally.

Owens in this fashion determined the percent contribution of individual differences to total variance for each of the six tests, and then averaged these percents to get an over-all measure of the relative importance of individual differences. He similarly analyzed the variance of the scores on all tests in all administrations for each individual into "between tests" (T.D.), "between administrations" (R.V.), and "error," and for each individual expressed as a percent the contribution of trait differences to the total variance involved. He then averaged these percents to secure an over-all measure of the relative importance of trait differences. He next tested the significance of the difference between these mean percentages and concluded, because the difference was not significant, that trait differences and individual differences are of the same magnitude. One cannot conclude, however, that because trait variations and individual variations represent equal proportions of different things, that they are therefore equal to one another. Individual differences were expressed as a percent of individual differences plus administration differences plus error. Trait differences were expressed as a percent of trait differences plus administration differences plus error. No explanation is given of how these sums can be considered to represent the same total variance (apparently one would have to assume that which is to be proved, i. e. that trait variations are equal to individual variations), while the figures given show definitely that they are not equal.

To summarize the analyses of the type first described, Owens totaled the sums of squares and degrees of freedom from the separate analyses for the six tests, to secure a table (Table 8) in which there are reported 78 degrees of freedom for "between individuals" and 72 degrees of freedom for "between administrations" (repetition). How one can have 78 degrees of freedom for "between individuals" in an analysis involving only 15 individuals or how on any consistent basis the 72 degrees of freedom are obtained for differences between administrations, are other mysteries that require explanation. Owens similarly summarized (Table 9) the data for the second type of analysis for the fifteen individuals, and in each summary table applied an *F*-test on the basis of the degrees of freedom thus obtained.

It should be noted that even though the percents obtained were comparable from the two summary tables, one may not conclude from a non-significant difference that trait differences and individual differences are of the same magnitude. To do so is to make the common mistake of attempting to prove a null hypothesis. Owens is guilty of this latter mistake at another point also when having tested the homogeneity of a number of variances, he says (p. 309) that, "In all cases, the value of *L* failed to reach over the 5 percent-level, which means that the variances within groups are the same" (p. 309).

Owens' study involved several other complex procedures which, because of space limitations, cannot be discussed here. On the whole, his study is commendable for ingenuity but is open to criticism because of inadequate reporting of procedures and questions of technical logic. It would seem advisable that educational research workers feel their way slowly in becoming acquainted with the possibilities of analysis of variance and be content for a while with relatively straightforward interpretations of relatively simple applications.

Evans and Wren (14) stated that they applied ". . . analysis of variance technique with two criteria of classification, Thinking I-E (Introversion-Extroversion) and Miller Analogies scores . . ." (p. 51). The trait studied was scholastic achievement. Four classes were formed with reference to each variable by dividing the distribution of scores into fourths. Aside from the fact that partial correlation techniques might have been more appropriate, this study is cited because of the apparent pointlessness of one of the tests applied. On page 51, Evans and Wren stated, "When the variance within the Analogies . . . groups was considered, there was insufficient evidence to determine any difference in the scholastic achievement of the four Thinking I-E . . . groups." This is interpreted by the reviewers to mean that the significance of the "between Thinking I-E quarters" mean square was tested with reference to the "within Miller Analogies quarters" mean square by the *F*-test. This further illustrates the tendency to give inadequate consideration to the terms used in an *F*-test. The denominator in all such tests must be meaningful as an "error" term with reference to the numerator—the hypothesis tested being the hypothesis that the numerator variance is entirely attributable to chance fluctuations of the type measured by the denominator.

Gabel's study (17), which was concerned with the relative effects of definite and indefinite quantitative terms upon comprehension and retention of social studies material, illustrates a higher order analysis. The subjects were the pupils in four grades in each of nine different school systems. The total sum of squares was analyzed into "between modes of presentation," "between grades," "between schools," and all possible interaction components. The triple interaction component was used to form the error mean square. The only effect tested for significance was the "between modes of presentation" effect, all other effects having been determined for the sole purpose of eliminating them from the error term.

In a study of the factors affecting the efficiency of inductive reasoning, Long and Welch (23) carried out an analysis of variance with reference to the three variables: "subjects," "degree of abstractness," and "number of antecedents." They obtained all possible interaction terms and used the triple interaction variance as the error term. Both "abstractness" and "antecedents" effects were tested and found to be significant. Then, in order to determine the relative potency of these two factors, they tested the *F*-ratio between the "abstractness" and "antecedents" variances. Since the *d.f.* were the same for both variances this may have served a practical purpose in this particular case; this procedure, however, is generally invalid. A means of estimating the relative contributions of the various factors to the total variance which may be used when an appropriate error term is available is that described in the preceding discussion of the study by Owens.

Rubin-Rabson applied the Graeco-Latin square design in a series of seven studies (41, 42, 43, 44, 45, 46, 47) dealing with memorization of piano music. The second study, which is typical of this series, was concerned with a comparison of massed and distributed practice. Nine subjects, nine selections, and three methods were involved. Each subject memorized the nine selections, each of the three methods being used for a different set of three selections. By means of nine "3 x 3" Graeco-Latin squares, Rubin-Rabson balanced the three method sequences for all nine subjects and at the same time balanced the compositions. Obviously the balancing of the method sequences served also to balance the methods.

The advantage in such situations of the Latin or Graeco-Latin square designs is that they permit the use of a method of analysis of variance, which recognizes by reducing the error term that the counterbalancing increases the precision. (Research workers using other counterbalanced designs have often incorrectly analyzed the results just as if simple random sampling techniques had been employed.) This advantage, however, is not obtained without a price. The balancing of certain of the variables precludes the determination of interaction effects, some of which may be of as much interest as the main effects themselves. Hence, the use of this technique involves the assumption that there are no real interaction effects present or other more complex assumptions. In terms of the study under discussion this is tantamount to assuming that whatever method works best for one selection works best for all selections, or that whatever method works best for one subject works best for all subjects, or that whatever selection is most readily learned by one subject is also the selection most readily learned by the other subjects. It seems unreasonable to suppose that such assumptions are closely satisfied in this particular situation, although they may be nearly enough met so that a pooled error term may serve adequately for a rough test of the main effects. Before adopting the Latin or Graeco-Latin square designs, therefore, research workers in education should consider carefully the assumption implied, namely, that there are no real interactions, and should consider also the possibility of using a factorial design that will permit an evaluation of possible interactions.

Rubin-Rabson, apparently employing a procedure similar to that used by Owens, obtained an estimate of the potency of each variable in terms of a percent of the total variability, and placed considerable emphasis upon this estimate in interpreting her findings. It should be noted that such a procedure is valid only when an appropriate error term is used. It is doubtful that the error term yielded from the data as they are arranged in Rubin-Rabson's design is appropriate for this purpose. Certainly with the small numbers of categories employed, these percent estimates are highly unreliable and should be cautiously interpreted.

A word should also be said relative to a variation introduced by Rubin-Rabson in the fourth study of this series (44), in which the methods were not rotated but were presented to all subjects in the same order. If this was really done, the "order" differences would be inextricably mixed or "confounded" with the "methods" differences. Rubin-Rabson apparently was not aware of this fact, since in analyzing her data she somehow obtained separate sums of squares for "methods" and for "order." Apparently she obtained the same sum of squares twice, in one case calling it the "methods" sum of squares and in the other the "order" or "sequence" sum of squares. If this is a correct interpretation of her statements, she thus deducted the intermingled effects of "methods" and "order" from the residual or error term not once but twice.

Studies Employing Analysis of Covariance

Most research workers in education are familiar with the "matched groups" type of experiment and are aware of the administrative difficulties involved in attempts to match groups of school pupils. Since the method of analysis of covariance offers a way of securing the same degree of precision without the administrative inconveniences of matching, it is surprising that this technique has not been more widely adopted by educational research workers. However, the reviewers were able to find only one published study in which this procedure had been employed. This is a study by Spencer (50), concerned with the retention of orally presented materials. In one phase of this study Spencer tried seven combinations of different frequencies and temporal spacings of the administrations of a recall test to pupils to whom certain expository materials had been presented orally. The seven experimental groups involved (one for each combination) were each composed of eight school classes. Since the classes were of approximately the same size, Spencer dealt with the unweighted class means as individual measures. The subjects were given an initial test of learning ability and a final criterion test after a lapse of sixty-three days, during which the various experimental procedures were administered. By standard procedures of analysis of covariance, Spencer analyzed these data so as to obtain (a) a "between groups" variance adjusted for differences between the groups in learning ability as revealed by the initial test, and (b) an appropriate error variance. Hence, by means of the F-ratio he was able to test the hypothesis that learning ability being constant, the experimental procedures are equally effective. The difficulties met in the ordinary matched groups experiment are considerable, but those which would be involved in an attempt to make up two groups of intact school classes would be almost insurmountable. The method of analysis of covariance permitted the equivalent of such an experiment with a minimum of administrative difficulties.

Conclusion: Need for More Complete Reporting

While examining the studies cited in this chapter, as well as many others not mentioned, the reviewers noted again and again the sketchy and inadequate manner in which the procedures used were described and the findings reported. In many instances it was utterly impossible to infer from the writer's description what statistical procedures had been employed, or, where the procedures could be identified, to check in any satisfactory way the accuracy of their application. The present review indicates a real need for more enlightened application in education of the newer statistical techniques, but, in the opinion of the reviewers, there is an even greater need for accurate, unambiguous, complete, and meaningful reporting. One need not present all the original data or reproduce all computations in a research report, but unless studies are at least so reported as to enable the reader to decide for himself whether or not an appropriate method of analysis was employed, or to check the crucial steps in the application of the method used (appropriate or inappropriate), the findings have no scientific value. In justice to the research workers it is only fair to say that the editors of the research journals may in part be responsible for this situation, through always urging brevity. They, at any rate, are in position to require the improvement that is so seriously needed.

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CHAPTER V

Evaluative Studies

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Scope of Chapter

EVALUATIVE STUDIES IN EDUCATION are numerous and varied. They range all the way from casual and informal appraisals that can hardly be dignified as studies or research (1, 26) to elaborate investigations requiring years of time by relatively large staffs richly endowed with foundation support (2). No attempt is made in this chapter to review all studies that come within this range. That would require an entire issue of the REVIEW rather than one chapter. The scope, therefore, is limited to a discussion of the over-all evaluations of entire educational programs or institutions. Studies involving an evaluation of schools by pupils and by outside or accrediting agencies have been extensively explored during the past decade. The chapter is limited, furthermore, to evaluative studies of secondary and higher education. Because practically all children who complete the elementary grades now go on to high school, the few follow-up investigations that have been made at this level are primarily concerned with achievement in secondary schools. Although this phase is important these restrictions prevent investigating acceptance of responsibility and community living. Clark and others (6) in 1940 summarized studies on the social effectiveness of education in such areas as financial and vocational success and school subjects.

From Measurement to Evaluation

Marked changes have taken place during the past few years in the nature of the studies designed to evaluate education (40, 41, 44, 60). The most apparent and, perhaps, the most significant is the broader scope of these investigations. Whereas previously the emphasis was upon measurement of single aspects of achievement, discrete behavior traits, or specific abilities, now more and more stress is placed on behavior patterns or appraisal of the educational program in terms of all the major objectives it seeks to attain (32).

Two major reasons can be cited for this change. In the first place, as measurement techniques improve or as they are available in wider variety, it becomes possible to measure larger and more complex aspects of behavior and to judge programs in terms of more comprehensive criteria. In the second place, the prevalent conception of education has changed from one predominantly concerned with the development of specific types of achievement as in spelling, knowledge of American history, or physics, to one concerned with the development of total personalities—whatever that might mean scientifically. Psychologically, stress on interaction now supplements that placed upon reaction. This has led to broader programs of evaluation as described by Eurich (16, 17), Foster and Wilson (22), Lorge (33), Raths (47, 48, 49), Smith and Tyler (51), Troyer (55), Tyler (57), and Wrightstone (61, 62).

Purposes of Evaluation

Evaluative studies are undertaken for a variety of purposes. Some of the most important are:

1. *To check on the effectiveness of educational institutions in terms of behavior changes in or achievements of students*—Most evaluation in educational institutions has been concerned with testing or with other methods of appraising the knowledge and skill of individuals gained in courses (36). Educators have generally assumed that desirable behavior or action will follow knowledge and skill. In most courses the achievements of students, as measured by tests and examinations, are the immediate ones—those apparent after a short period of rather intensive training. In contrast, the tests developed by the Cooperative Test Service (9), and by the Eight-Year Study of the Progressive Education Association (51) are not limited in their use to specific courses. Although the effectiveness of a program can be measured in part by immediate results, the fact that much education is designed for future use indicates the need for an evaluation of student development over a longer period of time. After leaving school, individuals are subjected to many situations. Their abilities to make the necessary adaptations in after-school life and to achieve in relation to their capacities constitute acid tests for an educational program. Consequently, there is the need for follow-up studies which are broad in scope and not limited, as were many of the earlier appraisals, to financial and vocational success.

2. *To plan future educational programs and procedures*—This purpose follows the first. Most evaluative studies are being made to provide a basis for improving the program (25, 30, 37, 54). Again, to serve this purpose the studies must be sufficiently broad to affect not only the administrative policies of the institution but curriculum policies and the counseling of the individual student as well. In short, they need to cover the total program.

3. *To accredit institutions*—With the development of a broader conception of education, considerable dissatisfaction arose with accrediting procedures concerned primarily with the financial resources, the number of books in the library, and the training and experience of teachers. The evaluative studies that are setting the new patterns for accrediting procedures are likewise concerned with all the major objectives of the institution (7, 42). They follow, therefore, the same trend as other studies.

Methods Used in Evaluative Studies

Most of the methods used in evaluative studies are given full treatment elsewhere in this issue. By far the commonest method in follow-up studies is through the use of questionnaires. These have proved to be the most flexible and economical, though by no means the most reliable, method for securing evaluative information. Rating scales are at times incorporated in or supplement the questionnaires. Analysis of records gives information on the administration of the institution and on the development of individuals over a period of time. Tests are perhaps the commonest evaluative measure applied to students in school and can be constructed to measure a wide variety of traits and behaviors. Direct observation furnishes data on some outcomes of education to an extent not possible by any of the above methods. Interviews provide another method of investigation as do reports by the subjects. These last three, properly used, can encompass more dimensions of thinking and acting than the first four, but the results do not lend themselves to statistical treatment.

The important point about methods in evaluative studies is that a wide variety must be used if a comprehensive evaluation is to be made. Each has its advantages and limitations, each complements and supplements the others, each is subject to misuse and misinterpretation. As new values in education are defined, as new needs arise, new techniques must be devised to appraise aspects of the educational program in order better to evaluate the whole.

Descriptions of Evaluative Studies at the College Level

Outstanding comparative studies of institutions include the extensive work of the North Central Association (42) and the Carnegie Foundation study of schools in Pennsylvania (31). The latter was based primarily on achievement examinations in the major subjectmatter divisions of college programs.

Prior to 1941 most follow-up appraisals of college programs were concerned only with the very limited objectives of economic and occupational success (14, 15, 19, 23, 29, 34, 38, 52). The most recent and extensive of a long line of studies of this character is the one by Babcock (3). Its unique contribution lies in the fact that the data were drawn from a scientific sample, based on the *Fortune* poll technique, of the status of all living United States college graduates. It provides the most complete and accurate data available on the economic and occupational status of college-trained men and women.

Follow-up studies concerned with a more complete range of college objectives have been relatively few, but undoubtedly their number will increase. The most extensive, in terms of the range of objectives covered, is that conducted by the General College of the University of Minnesota, reported by Pace (45). The General College was revising its curriculum to bring it more nearly in line with the characteristics of its students and the adults they were likely to become. A 52-page questionnaire was sent to a sample of former Minnesota students, both graduates and nongraduates, out of college from one to twelve years. The questionnaire covered activities, problems, attitudes, and interests in four areas of living—vocational, home and family, socio-civic, and personal. Attractively printed and profusely illustrated, the questionnaire drew returns from 70 percent of the former students who received it. In the questionnaire were standardized scales to measure job satisfaction, economic status, cultural status, liberal-conservative attitudes, general adjustment, and morale. All the items were of the checklist type. Supplemental interviews were held with 172 of the 951 questionnaire respondents.

Extensive comparisons between the responses of graduates and nongraduates provided the basis for judgments concerning the effectiveness of college education. Further judgments about the strengths and weaknesses of the college program were based on the extent to which the typical pattern of activities, interests, and attitudes of the college-trained adults corresponded to the kinds of behavior which the college faculty believed should characterize college-trained adults. For example, the responses indicated that these adults held inconsistent attitudes toward related social problems; that many of them were interested in effecting home economies, yet they followed many uneconomical practices; that they were interested in broad national problems but not in local and community affairs. Results such as these were interpreted by the faculty as reflections—at least in part—on the inadequacy of the college program. The basic interpretative problem of follow-up studies of this kind lies in this question: To what extent are we justified in praising or blaming the college for the activities, interests, and attitudes of young people who, in this study, have been out of college from one to twelve years?

In the General College study some indirect evidence concerning the reliability and validity of responses was available. Approximately 7 pages of the questionnaire consisted of standardized scales of known reliability. These reliabilities centered in the .80's. Another 2 or 3 pages consisted of straightforward factual questions, such as: What is your job? How many children do you have? Approximately 10 pages were composed of questions regarding activities, such as: Did you plan expenditures on a budget? Did you make any articles of clothing during the past year? Did you vote? Did you have your teeth examined? One of the reasons for including so many simple questions of this "yes or no" type was the staff's belief that adults' answers to them would be straightforward and dependable. Not much evidence was available concerning the trustworthiness of responses to the 16 pages of items dealing with attitudes, opinions, enjoyments, and degrees of interest and participation. Some of the items, however, had been used previously in studies of General College students and their parents (10), and cross comparisons among the various groups suggested that the differences in responses were in line with what one would expect.

The questionnaire contained 7 or 8 pages of items designed to probe adults' need for more information. The responses to these questions were difficult to evaluate. Interviews with a sample of the questionnaire respondents indicated that among the men a majority had checked these items because they had actually experienced a need for the information, whereas among the women a majority had checked the items because they felt they ought to know more about them. The staff professed least confidence in the answers given to these questions. Many questions of this sort were employed by Fenlason and Sletto (20, 21) in a questionnaire follow-up study of social case workers in Minnesota. In a section on social case work techniques, a checklist of thirty-seven techniques was preceded by the question: "Do you feel an urgent need for additional knowledge of this technique in the satisfactory performance of your work?" The focus of the inquiry upon a job analysis and the phrasing of the question in terms of an urgent need provide a more appropriate setting for this type of item than occurred in the General College study.

Other colleges have attempted to appraise the effectiveness of their educational programs by sending questionnaires to alumni which solicit directly their opinions concerning the values of their college experiences. The follow-up questionnaire sent to former Bennington College students (18) and the Stanford follow-up inquiry by Isle (27) are examples. One item included a list of fifty features such as: "1. individual conferences with counselors; 2. social life at the college; 3. system of trial majors; 4. housing facilities." The alumni rated each of these features as "very satisfactory," "fairly satisfactory," "neutral," "rather unsatisfactory," or "very unsatisfactory." Free response or essay questions were also used. For example, "List in order of importance the experiences, courses, or instructors that, in your judgment, made the greatest contribution to your development while at Bennington." "What defects were there in your college work as you see it now?" The Stanford follow-up questionnaire was designed for alumni who were engaged in teaching or in other educational work. Rating scales, checklists, and free response items were also included.

The chief interpretative problem in this type of questionnaire lies in the extent to which alumni can introspect reliably about the values of their college experiences. It is likely that old graduates develop a halo about the values of their education which tends to make their judgments unreliable. The purpose of the investigation may likewise influence results. Criticisms on both these points can be made of the work of Tunis (56) and Rogers (49). Both of these studies included old graduates, and both studies were made to celebrate college anniversaries: the former to commemorate the 25th reunion of a Harvard class, and the latter to celebrate the 75th anniversary of Vassar College. Greater faith in the results is justified when the subjects are recent graduates and when the purpose of the investigation is frankly to evaluate and improve the college educational program. Recent graduates experiencing the demand of new tasks may have valuable insights to contribute to the college faculty regarding the strengths and shortcomings of the instructional program. Isle (27) reported that Stanford graduates were much more critical of the Stanford program than were their employers.

The follow-up study, as a means of appraising the effectiveness of education, is used most appropriately as but one phase of a larger pattern of evaluation of a college program. The complete evaluative studies of Bennington College, the General College of the University of Minnesota (12), and Stanford University's School of Education (35) used standardized achievement tests, numerous questionnaires, checklists, interviews, and rating scales with students and faculty in college as well as a follow-up of graduates.

Evaluative Studies at the Secondary-School Level

Four major evaluations using follow-up studies as part of the total pattern of appraisal may be cited—the American Youth Commission, the Cooperative Study of Secondary School Standards, the New York Regents' Inquiry, and the Progressive Education Association Eight-Year Study.

Stimulated by the youth problem of the depression years, Bell's study (4) for the American Youth Commission was a pioneer attempt to determine and analyze the status of a representative sample of Maryland youth, ages sixteen to twenty-four. Interviews were held with more than 13,000 young people, sampled on the basis of sex, race, school status, job status, social and economic status, marital status, type of community, and other relevant factors. The study was concerned with youth at school, home, at work, play, and church. In appraising their schooling, three-fourths of the total group said they had received no vocational guidance (yet economic security was their most pressing problem), 27 percent attributed little or no economic value to their schooling, and 12 percent attributed little or no cultural value to it. The amount of schooling youth received and their appraisal of its value were clearly related to the economic and occupational status of their parents.

The follow-up phase of the Eight-Year Study has been reported by Chamberlin and others (5). Graduates from thirty experimental high schools were matched with graduates of traditional high schools on factors of scholastic aptitude, sex, race, age, religious affiliation, size and type of high school, size and type and location of community, socio-economic status of family, and extracurriculum activities in high school. The subsequent success in college of both groups was compared. College records and reports, special questionnaires and tests, and personal interviews were used to gather evidence with respect to nine aspects of college success: intellectual competence, cultural development, practical competence, philosophy of life, character traits, emotional balances, social fitness, sensitivity to social problems, and physical fitness. In many of these areas or aspects of competence the mass of data for each student was summarized by means of judges' estimates of its correspondence to briefly described behavior levels or types. For example, to get a judgment on the extent of students' interest in current affairs each case was rated to fit one of the following five categories (5, p. 13):

1. Matters of social, economic, political, and humanitarian significance command his interest and objective study. Does something about it. Membership, writing, contributing, agitating.
2. Considerable reading and discussion of these matters. Many matters of social, economic, political, and humanitarian significance command his interest. May or may not do anything about it.
3. Somewhat limited or inconstant interest in many phases of these matters. Usually aware of them.

4. Limited to certain phases, or sporadic only. Little attempt to keep up with what is going on.
5. Not interested at all.

This rating technique has been used previously and comprehensively by Darley and Williams (11) in analyzing the case records of one hundred students of Minnesota's General College and their parents. Williamson and Bordin (58, 59) used a similar method of rating materials from case records in evaluating the success of student counseling.

Other features of the graduate follow-up in the Eight-Year Study are noteworthy. The staff selected graduates from the six schools whose programs were judged to have departed most significantly from traditional practices, and then from the two most experimental schools, and compared them with matched students from traditional schools. In these comparisons differences between experimental and control groups were successively greater than the ones revealed between the total experimental and control groups. Simple and common sense methods of analysis such as these are highly appropriate for evaluative data which, at the present level of development, are not precise in any mathematical sense. Final value judgments of the success, goodness, or effectiveness of educative experiences are and should be based on the main trends and major patterns of results from a variety of data.

Follow-up appraisals in the Regents' Inquiry are reported by Eckert and Marshall (13). A battery of tests of information, skills, aptitudes, and attitudes was given to pupils about to leave high school. Further data were obtained from questionnaires and from school principals after the pupils' withdrawal. Analysis of the traits and attitudes, patterns of interest, plans for the future, and present school and work activities thus obtained provides evidences of the social competence of leaving pupils, and by implication, of the success of the schools' programs. Subsequent interviews with the pupils, principals, and a third party, held several months after withdrawals, gave further data for judgment on the vocational, social, and leisure-time adjustment of former pupils.

In the Cooperative Study of Secondary School Standards (7) a seven-point program of appraisal was employed in judging two hundred secondary schools: use of the *Evaluative Criteria* (8), judgments of field committees, progress of pupils as measured by standard tests, college success of pupils, noncollege success of pupils, judgments of pupils, judgments of parents. College success was measured solely in terms of academic success. Noncollege success was judged from responses of former pupils to a questionnaire which called for ratings on reasons for leaving school, helpfulness of school in vocational placement and progress, contribution of school in developing various appreciations and interests, and general comments on the satisfactoriness of high-school experience. Judgments of pupils in school were likewise obtained from questionnaires combining rating scale and essay type items. Parents' judgments were solicited by questionnaire rating scales with respect to their degree of satisfaction with twelve aspects or goals of the school's program—such as good citizenship, social life, educational guidance, and reading habits.

Several other evaluations of schools by students, parents, and laymen have been made (24, 28, 39, 43, 46, 50).

Contributions in Method: Approaches to Evaluation

The studies reviewed here are the most comprehensive. Many other studies could have been cited that used one or more of the wide variety of methods employed in the more comprehensive investigations. The contributions to methods made through these extensive investigations have been general rather than detailed. No new techniques were developed in any of these major investigations, but new ways of adapting and applying them were developed. The methods had all been used and tried in previous but more limited studies. For example, the institutional pattern map as used in the North Central Association studies had been used previously in a less extensive study of New York colleges. In essence the map was an adaptation to institutions of the profile charts for individuals, and the data for each variable on the map were gathered through common techniques, such as tests, questionnaires, records, reports, and interviews. Some major contributions, however, were made in adapting old methods to the comprehensive problems investigated and in setting a pattern for broad approaches to evaluation. These contributions are:

1. *In refinement of methods*—For example, the 52-page questionnaire used in the Minnesota study represents a high point in the use of this technique. Great care was taken in formulating each item in order to eliminate ambiguities. The questionnaire was tried out in preliminary form before it was printed with attractive layouts and many illustrations. In these ways a method that had been used extensively was refined for this particular study. Similarly, in other investigations the older methods were extended and refined in application.

2. *In the use of a wider variety of methods*—In the more comprehensive evaluations, a wider variety of methods has been used than was common in the earlier studies. In the Eight-Year Study, for example, interviews, questionnaires, rating scales, records, tests and examinations, and analysis of curriculums were all used. The best of the methods developed in previous investigations were applied in a single study in an effort to arrive at a more comprehensive evaluation.

3. *In analyses of major educational objectives as the basis for final evaluation*—In practically all the major investigations reviewed in this chapter, emphasis was placed upon the analysis of objectives as a basis for determining what data should be collected. In the Bennington study, college records, founders of the college, students, faculty, and trustees all contributed to an analysis of the objectives of the colleges. After these objectives were defined through extensive deliberations they provided the basis for collecting information through questionnaires, tests, rating scales,

records, and interviews. Briefly, this procedure, upon which the major studies agree, means that a sound evaluation of an educational program can be made only in terms of the major objectives that program is set up to attain.

4. *In following up individuals over a relatively long period of time*—The evaluative studies of recent years have sought to correct a deficiency in previous studies by following up individuals over a relatively long period of time. The Pennsylvania study (31) established a new pattern in this regard. Likewise the Eight-Year Study by its title designates a follow-up period. The spot evaluations of the earlier studies made over a brief interval were clearly inadequate because they did not reveal the contributions of the educational program to after-school life. As long as such was the case, institutions could make all kinds of unfounded claims for their programs. If follow-up studies of this type continue to be made the time may come when such claims are regarded as no more significant than the tales of the miraculous healing qualities of herbs peddled by the old medicine man.

More long-period follow-up studies must be made before more adequate appraisals of education will be available. This will mean fewer but more significant evaluative studies.

Contributions in Terms of Results

1. *The contributions of education are clearly disappointing if viewed from the standpoint of the claims made for it.* The Pennsylvania study (31) discovered unbelievably low accomplishments in many students who had the advantages of a college education. In the New York Regents' Inquiry, Spaulding (53) found that:

> Among the boys and girls leaving school each year are a considerable number whom the schools themselves are unwilling to recommend for responsible citizenship. (p. 17)
>
> Irrespective of the schools' judgment of their readiness for citizenship, the leaving pupils as a group are seriously deficient in their knowledge of the problems, the issues, and the presentday facts with which American citizens should be concerned. (p. 18-19)
>
> The boys and girls who are on the point of leaving school, whatever they may think about the desirability of certain kinds of action, are reluctant to assume responsibility for civic cooperation, or to commit themselves to action which will involve personal effort or sacrifice. (p. 24)
>
> Once he is out of school, the ordinary boy or girl does practically nothing to add to his readiness for citizenship, nor does he even keep alive the knowledge of civic affairs or the interest in social problems which he may have had when he finished his schooling. (p. 27)

In the Minnesota study, Pace (45) found that:

> The graduates were distinguished from the nongraduates chiefly by the fact that they were more likely to have professional jobs, a little—but not much—more income, and somewhat greater satisfaction with their jobs. In other areas of living there were few differences, or none at all, between graduates and nongraduates. (p. 51)

Briefly then, the results of these follow-up studies show that education has not been as effective as claimed by those responsible for carrying it on.

2. *Broader evaluations have been made possible*—This might be expected from the application of a wide variety of evaluative methods growing out of an analysis of objectives. These broader evaluations have, in turn, made possible better solutions to practical problems such as those involved in accrediting. The pattern map of the North Central Association and the *Evaluative Criteria* of the Cooperative Secondary School Study are examples.

3. *An array of judgments of relatively mature individuals on the effectiveness of the educational process has been provided*—For the most part these judgments give a more encouraging picture of the contribution that schools and colleges have made to the lives of individuals than do test results or analyses of the civic or social life of former students.

4. *Perhaps the major contribution is that derived by the institutions which conduct them*—If the study is made with all groups participating, as was the case in the Bennington study, in which students, faculty, and trustees all took part in a cooperative undertaking, the effect upon the institution is a major one. Thus, evaluative studies can and do form an important step in the development of the program at a given institution.

Major Criticisms of Evaluative Studies

Major criticisms of evaluative studies which need to be guarded against in future investigations are:

1. *The instruments used are not adequately appraised.* The questionnaires, for example, are in many cases elaborate but their validity and the reliability of results are too infrequently established. The refinement of instruments may be only an elaboration and may not actually contribute to the accuracy and dependability of results.

2. *The direct contribution of the schools and colleges is not isolated from contributions of other experiences.* Because the individual is the product of all his experiences and his native endowment, it is practically impossible to isolate the contributions of the educational program to his development from the contributions of other experiences. In follow-up studies it is desirable that the investigation be extended over as long a period as possible. The longer the period, however, the more difficult it becomes to determine the effects of the educational program because many other experiences intervene. From the standpoint of the individual it is probably not important to isolate the contributions of school or college experiences. From the standpoint of evaluating the educational program it becomes very important to do so. The "control technique" as used in the Eight-Year Study is the only method used in the follow-up investigations for isolating, at least in part, the contributions of one form of education over another.

3. *Elaborateness of studies is discouraging to many school systems and institutions that desire to make an over-all evaluation of their programs.* No simple and inexpensive technique has as yet been devised nor is one likely to be devised that will provide an evaluation of an entire educational program. For this reason many schools and colleges feel they cannot make an evaluation of their program. Every institution, however, has an evaluation process going on at all times whether or not it is recognized as such. The comprehensive investigations which have been undertaken primarily as research projects provide many valuable suggestions. Although simpler methods may need to be devised for ordinary use this criticism need not be taken too seriously at this time. It is mentioned here primarily because many institutions have used it as a rationalization for not making a more concerted effort to evaluate their programs.

4. *Evaluative studies do not reveal contributions to the development of the individual.* Practically all the evaluative studies summarize data for groups. Case studies have been made but are difficult to interpret. In extending research studies there is considerable need for making more extensive case studies over a long period of time.

In spite of these criticisms, considerable progress has been made during the past decade in extending the scope of evaluation studies. More and more school systems, colleges, and universities are planning over-all evaluation programs in terms of their major objectives. The question usually arises as to who should carry on the process. Clearly if the purpose of evaluation is to provide a basis for improving the educational program, those responsible for this program should take an active part in the evaluation. To be sure, competent technical direction is needed. When provision is made for such direction the institution, through a cooperative undertaking, may make further contributions to the methods for carrying on evaluative studies as well as to the effectiveness of its own educational program.

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CHAPTER VI

Questionnaires, Interviews, Personality Schedules

FRANK W. HUBBARD

The Questionnaire

In Chapter IX of the December 1939 issue of the REVIEW the major criticisms of the questionnaire technique were pointed out. Recent professional literature reveals, however, that in spite of the advice given in this and other research publications, the common mistakes continue to appear with some frequency. There has been some tendency to restrict the use of the term "questionnaire" to forms that require statistical and objective replies; the terms "opinionaire" and "expressionaire" have been used by workers at the Character Education Institute of Washington University (15) on forms calling for subjective and qualitative answers.

Relatively few research studies have appeared since 1939 dealing directly and experimentally with the questionnaire as a method of investigation. A number of recent books and articles have, however, treated the methods, errors, and limitations of the questionnaire technique. Particularly useful are the chapters by Koos (14), Lindquist (19), Lundberg (20), Toops (41), Wert (42), and Young (44). Magazine articles with helpful suggestions have been prepared by Jenkins (11, 12) and Phillips (27).

Preparing the Questionnaire

Wording—The use of the questionnaire technique in surveys of opinions has led to greater attention to the wording of questions. Cantril (7) and Rugg (32), from experience with the Princeton Public Opinion Research Projects, reported that the use of the names of prominent men (such as Roosevelt or Hitler) definitely influenced the responses to specific political questions. Blankenship (3) pointed out the existence of "danger words" characterized by emotional appeal, ambiguity, and too high vocabulary level. Jenkins (11) suggested that there are four major ways in which questions may reduce the dependability of the answers: (a) by predetermining the answer thru the use of leading or "loaded" questions or thru the improper order of the questions; (b) by the use of ambiguous terms and vague questions; (c) by exceeding the ability of the respondent to use unfamiliar words or to deal with complex questions; and (d) by inviting inaccurate responses. Ghiselli (9) found that respondents were more willing to reply and that their replies were generally more satisfactory when they were allowed to qualify their opinions than when they were forced merely to agree or disagree with a fixed statement.

Pretesting—Both Blankenship (4) and Sletto (35) reported that pretesting the questionnaire with small groups insures greater reliability in the answers and increases the probability of a satisfactory return.

Questionnaire Administration: Sampling; Follow-Up

Sampling—Lindquist (18) called attention to the fallacy of using merely a large number of individual replies from a few schools when in reality the school is the unit. He recommends "stratified sampling" or the selection of cases from each identifiable subgroup within the total population under investigation. Both Reid (28) and Stanton (36) showed that those responding to mail surveys are not necessarily representative of the nonrespondents. In both studies having to do with the ownership of radio equipment it was shown that the "haves" are more likely to reply than the "have nots." Follow-up procedures are recommended to increase the proportion of the returns and thereby to reduce the possibilities of bias. Suchman and McCandless (37) found thru further mailed questionnaires and telephone interviews that the interest of the recipient in the topic under consideration and the amount of his education affected the return. Pace (26), in attempting to determine the probable direction of the bias in a study of college alumni, reported that [illegible]aduation from the university and the number of quarters of university work completed were important factors in influencing the returns.

In studying the flying habits of the patrons of airlines Rollins (30) found that a follow-up questionnaire gave a truer picture than a single inquiry and that double inquiries to a small list yielded greater returns than a single inquiry to a larger list. Shuttleworth's investigation (34) of the employment status of majors in technology confirmed the possibility of large sampling errors from incomplete returns. Returns from the original inquiry showed only 0.5 percent unemployed; replies from duplicate questionnaires used as a follow-up raised the percent of unemployment to 6.6; then a final drive, resulting in almost complete coverage of the group, brought the percent of unemployment down to 4.0 percent.

Increasing the returns—Moore (23) varied his procedures in submitting a questionnaire to superintendents of schools. He found that typewritten letters of transmittal brought 16 percent more responses than did duplicated letters. Follow-up letters produced a further 16 percent increase in the number of replies.

Reliability of Questionnaire Returns

Lewis (17) investigated the consistency of the replies of 216 teachers when asked to respond on two different occasions to the same questionnaire. He reported that in the second reply more than half of the teachers varied their responses on more than half of the items. In the most consistent report discrepancies were found with respect to only 16 percent of the items; in other cases, the responses varied on as high as 96 percent of the items. Lentz (15), using a social science "opinionaire," found changes on specific questions occurring with amazing frequency. Such variation would be expected, however, in responses to questions dealing with opinions. He concluded that the summation of reactions on a number of items was reliable. Neprash (24) studied the statistical reliability of questionnaire returns, reporting a 20 percent unreliability of responses to specific questions on social attitudes and opinions. These studies indicate the importance of proper questionnaire procedure and the limitations of certain types of replies.

Special Uses of Questionnaires

Byler (6) reported the use of inquiry forms in ascertaining the interests and needs of students prior to a program of curriculum revision. Lewis (16) found the questionnaire procedure effective in calling the attention of pupils to certain problems of pupil conduct, study hall conditions, etc. When followed by discussion in homerooms the results were apparently more satisfactory than the "preaching" plan so often followed in high schools. Gilkinson and Knower (10) described a multiple-choice guidance questionnaire for students of speech. Cureton (8) recommended the questionnaire (and other procedures such as the interview) in promoting group thinking. Outland and Jones (25) described the application of the questionnaire to curriculum appraisal. They warned of the limitations of the procedure, however, since pupils usually are interested in immediate problems more than in remote matters even tho the latter are vital.

The Interview

Few research studies have appeared recently with respect to the interview. Symonds (38), in an article on research in this field, cited only four studies during the entire period from 1926 to 1934. Based chiefly on experience rather than on the results of controlled studies, a number of general discussions of the interview technique are available. Among these are articles by Aldrich (1), Johnson (13), Symonds (39), and Wilkins and Kennedy (43). One usually finds in these discussions considerable emphasis on the importance of "rapport" with the person interviewed; the necessity of privacy; the wisdom of making systematic records after the conference; and the advisability of verifying data and using caution in making interpretations. The inquiry forms devised for a personnel research study in the General College of the University of Minnesota (22) have been termed "a contribution to the tools of social inquiry."

Schellhammer (33) suggested three ways of compensating for variability due to personal elements in an interview: (a) arrange several interviews per interviewee, each conducted by a different consultant; (b) have each interview conducted by a series of experts, each concerned with the phase related to his own field of specialization; or (c) have several consultants sit as a committee to conduct each interview. He also recommended that each interview be focused on a single, clearly defined purpose.

Recording the Interview

Symonds (40) attempted to discover experimentally the amount and types of material forgotten in various periods between the interview and its recording. He concluded that records made immediately after the interview contained the maximum of details. Most significant parts of the interview, however, were usually not forgotten even tho not immediately recorded. The lapse of a reasonable interval of time resulted in dropping relatively unimportant details and may have favored integration of significant facts.

Vocabulary of the Interview

Many of the studies that apply to the formulation of questions in questionnaires apply equally to the interview procedure. Roslow and others (31) reported on the basis of field studies of the Psychological Corporation that the use of stereotypes or emotionally charged words may produce marked changes in responses; also, that the responses to alternatives in checklist questions are influenced by the number and the completeness of the alternatives. Young (45) called attention to the differences in meanings for different persons of such common terms as "housing," "unemployment," and "cost-of-living." Her recommendations as to careful organization of the blank, recognition of the background of respondents, use of simple words, and avoidance of emotionally charged words are similar to the proposals usually made with respect to questionnaires.

Special Uses of the Interview

As is true of the questionnaire, the interview is being used more widely in administration and instruction. For example, Anderson (2) suggested that pupils be encouraged to prepare "imaginary interviews" with the characters of history since the method requires familiarity with facts about each character studied. Robinson (29) suggested the interview as a way to discover administrative problems and to receive suggestions from teachers with respect to their solution. Merrill (21) advocated the use of the interview in obtaining material for high-school papers and in other news-gathering activities. Brophy (5) found the interview a valuable supplement to test results and questionnaire reports in counseling university students.

Personality Schedules[1]

Personality and character tests were treated in Chapters V and VI of the February 1941 issue of the REVIEW. Only a brief note, therefore, will be added here.

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[1] This section was prepared by Ruth Strang.

The California Test of Personality (49) covers somewhat the same areas as the well-known *Bell Adjustment Inventory*, but including a lower age level. The profile constructed on the basis of the responses is divided into two sections: self-adjustment and social adjustment. Somewhat different in form and most carefully developed is the *Detroit Adjustment Inventory* (46) designed for junior and senior high-school students. It consists of 120 items dealing with 24 "problem situations." For each item there are five statements in the first person of which the subject indicates the one that describes him best. This inventory has been in use for more than three years in the Detroit Psychological Clinic and significant differences were found between scores of sixty-one behavior and twenty-seven non-behavior cases. The *Minnesota Multiphasic Personality Schedule* (53) is superior to the personality schedules whose scoring keys were constructed on a statistical rather than on an experimental basis; it has been standardized on 1,500 normal individuals and on 220 psychopathic patients. The unique features of *My Personality Growth Book* developed by McCall and Herring (54) are emphasis on improvement in personality and use primarily as a teaching instrument. Five new experimental scales were developed by Darley and McNamara (50) on the basis of factor analysis applied to test and retest performance on thirteen existing attitude and adjustment scales. The numerical high point in factor analysis was reached by Brogden (48) who made a factor analysis of the character traits involved in the scores of forty tests purporting to measure various phases of character, intelligence, and personality. No one has yet demonstrated, however, the correspondence between the traits which come out of the factor analysis and the personality patterns of individuals.

Critical Appraisal of Personality Measures

The approach to the study of personality through tests of evaluative attitudes has proved its worth, according to the comprehensive review of this type of test made by Duffy (52). When certain other types of self-estimate questionnaires have been subjected to realistic validation, as by Bonney (47), Dudycha (51), Ryans (55), and Wile (56), individual errors of judgment have been found to be extensive. The findings of Bonney (47) are welcome, if not reassuring. The reports of fifth- and sixth-grade pupils on their absences, library book withdrawals, Sunday-school attendance, and weekly spelling scores for one semester, when compared with the actual records, showed an average complete accuracy of only 27 percent and an approximate accuracy of 43 percent. Accuracy of estimate seemed not to be related to chronological age or I.Q.

Additional evidence of the inaccuracy of self-appraisal in individual cases was presented by Ryans (55) on the bases of his analysis of test scores and self-ratings on a five-point scale of items on (a) correct English usage, (b) effectiveness of English expression, (c) speed of reading comprehension, (d) understanding of difficult reading materials, (e) extent of vocabulary, (f) general cultural knowledge, and (g) knowledge of current happenings. Self-appraisals, in the form of group averages, were reasonably accurate but individual errors of judgment were extensive in many cases. Wile (56) obtained experimental evidence of the lack of validity of personality tests by comparing the diagnostic statements derived from several methods of personality study with the case records of one hundred clinic children and with items determined by the chance selection of playing cards. The percentage of correct statements derived from the chance test was as high or higher than the results obtained through several methods alleged to have true diagnostic value.

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CHAPTER VII

Test Development: Statistical Aspects[1]

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For the period reviewed the large number of publications, either directly or indirectly related to the statistical aspects of test development, made it imperative that severe restrictions be imposed on the scope of the following discussion. Correlation, analysis of variance, and other techniques were not reviewed unless they happened to relate to tests. It may be observed that although the greatest frequency of publications was found under factor analysis, the studies apparently showing the keenest insight in terms of analysis of basic concepts appeared under reliability.

Bibliographies and General Discussions

In a restricted manner this review continues the previous one by Flanagan (24)[illegible]ok (9) and Potthoff (52) gave general discussions of achievement testing. Horst (38) considered the logical bases underlying all testing and especially personal adjustment. Dunlap (20) presented a classified bibliography of statistical developments over a three-year period, and concluded with a summary of certain statistical errors made by psychologists. Swineford and Holzinger (59) continued their annual summaries of statistical developments. Weidemann (62) reviewed the conflicting evidence concerning the inconsistency of measurement indicated by essay as compared with objective studies. Jackson and Ferguson (41) discussed studies of the concept of reliability. Though not restricted to test statistics, the *Journal of the Royal Statistical Society* has published a rather comprehensive annual bibliography of statistics since 1936, largely under the direction of J. O. Irwin.

Factor Analysis

The popularity of factor analysis methods is attested by the fact that the greatest frequency of studies was found in this area. A number of trends seemed to be discernible. There was an increased emphasis upon the logical implications of factors and an attempt to reach some kind of synthesis among the various methods. Increased ease of computation was being sought with some success, and more nearly adequate tests of significance seemed to be in the process of incubation. As usual, the empirical application of the method formed the modal type of study. No new methods of factor analysis were found in the educational field.

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[1] Statistical methods are treated also in Chapters IV and VIII of the present issue; chapters devoted to statistical methods have previously appeared in the REVIEW OF EDUCATIONAL RESEARCH as follows: ¶ John C. Flanagan, "Statistical Methods Related to Test Construction and Evaluation." 9: 109-30; February 1941. ¶ Karl J. Holzinger, "Factor Analysis." 9: 528-31, 619-21; December 1939. ¶ Douglas E. Scates, "Index Numbers and Related Composites." 9: 532-42, 622-25; December 1939. ¶ Palmer O. Johnson, "Statistical Methods." 9: 543-54, 626-29; December 1939. ¶ Max D. Engelhart, "Classroom Experimentation." 9: 555-63, 629-30; December 1939. ¶ Edward E. Cureton and Jack W. Dunlap, "Developments in Statistical Methods Related to Test Construction." 8: 307-17, 357-62; June 1938. ¶ Herbert A. Toops, and G. Frederic Kuder, "Test Construction and Statistical Interpretation." 5: 229-41, 309-14; June 1935. G. M. Ruch, "Recent Developments in Statistical Procedures." 3: 33-40, 65-72; February 1933. ¶ Additional brief treatments occurred in the following chapters: December 1938, Chapters V (Frutchey) and VII (Scates); December 1935, Chapter III (Lindquist); February 1933, Chapter II (Osburn); and October 1932, Chapter IV (Baker).—Editor.

Among the attempts to synthesize the various factor systems and to indicate where each might be used appropriately were the publications of Burt (2), Holzinger and Harman (35), and Swineford (58). Holzinger and Harman (35) considered the various types of factor analysis and pointed out the desirability of separating the statistical aspects from the theories in a particular field. They gave a discussion of statistical criteria leading to a choice of form and method, and prepared a compilation of the leading factor systems. Swineford (58) compared multifactor and bifactor analysis. Burt (2) emphasized the essential similarity of all factor theories and all methods of factor analysis, a contention he supported with data on temperament types. Burt urged that factor analysis be regarded as a logical rather than a mathematical method. Logically, he insisted, factors were principles of classification which specified a system of relations. A factor was valuable because it enabled us [illegible] hold in mind a definite but complex pattern of characteristics. For this point an excellent illustration was provided by two studies of verbal ability. Carroll (3) confirmed Thurstone's M, but V was split into three factors, and W was split into two. Johnson and Reynolds (43), however, found two factors which appeared to be closely related, if not identical with, Thurstone's W and V factors.

Other developments were Horst's (37) method for transforming an arbitrary factor matrix into simple structure by a method which is almost entirely objective; Coombs's (10) and McNemar's (47) discussions of criteria for determining the number of factors to be extracted; and Ferguson's (21) indication that differences in difficulty between two tests or two test items were represented in the factorial configuration as additional factors suggesting that if all tests included in a battery were roughly homogeneous with reference to difficulty, existing hierarchies would be more meaningful. Guilford (30) brought out the same point when he indicated that the same kind of item might measure different abilities according as it was easy or difficult for the individual. General discussions of factor analysis were given by McCloy (45) and Holzinger (36).

Two discussions of tests of significance were worthy of mention. McNemar (46) reported that three empirical studies on factor loadings agreed in showing that sampling behavior of the first centroid factor loading was much like that of correlation coefficients, whereas sampling fluctuations for loadings beyond the first were distressingly large. Young (64) applied the method of maximum likelihood to the problem of estimation in factor analysis. In a special case he observed how test fallibility entered into factor determination, and that the method of communalities underestimated the number of factors. It is hoped that Young will continue his studies to include the more general case.

Reliability

Especially noteworthy among studies of reliability was the increasing substitution of an analytic rational, rather than a crude empirical, attack on the basic problems and concepts. Outstanding in this respect were the studies of Hoyt (39), Jackson and Ferguson (41), and Kelley (44).

Kelley (44) defended the traditional odd-even reliability coefficient and indicated that it was a quantitative statement of an act of judgment that the things correlated were similar measures. It was because the Kuder-Richardson formulas ignored this act of judgment that they were inadequate. Kelley argued, further, that it was less severe to split halves than to draw up items in the first instance which measured the same function.

Though he questioned the Kuder-Richardson formulation of reliability, Kelley considered the idea important in connection with a definition of the "coefficient of coherence"—a measure of the singleness of purpose of th[illegible]ms constituting the test. Kuder and Richardson assumed complete unity of purpose when they assumed a rank of one for their correlation matrix of test items, but Kelley thought it better to measure actual proximity to a rank of one by computing the "coefficient of coherence."

In a penetrating analysis of reliability, Jackson and Ferguson (41) showed that reliability may be interpreted with emphasis on errors of measurement, on stability of scores, or on sensitivity for assessing individual differences. They would abandon the blanket term reliability in favor of more specific estimates of absolute and relative accuracy of measurement. Estimates of reliability, they suggested, could best be obtained by the analysis of variance since it separated the influence of errors, practice, individual differences, and facilitated the computation of Jackson's measure of sensitivity.

Several experimental studies were cited to show that retest, comparable form, and split-half reliability were not the same. The Kuder-Richardson measure, they indicated, was based upon internal consistency whereas the usual definition implied agreement between two sets of measurements. To find the most reliable combination of a group of tests a method of combinatorial analysis was described. Those who work with tests will find the "Suggested Test Report" (41:104) of considerable value.

Similarities and contrasts between the Kelley and the Jackson-Ferguson discussions may be observed. Both criticized the Kuder-Richardson formulation of reliability. Kelley would retain the traditional split-half form whereas Jackson and Ferguson would substitute measures of absolute and relative accuracy of measurement. Both indicated that the assumption of a rank of one for the correlation matrix was untenable. Kelley would evaluate the rank by his "coefficient of coherence," while Jackson and Ferguson showed that the assumption was sufficient but unnecessary.

The present reviewer agrees with Jackson and Ferguson that there is considerable merit in using the analysis of variance for obtaining more specific descriptions, but also recalls that it was Jackson (40) himself who warned against the adaptation of methods from agriculture to the field of education without making modifications to fit the new conditions in education. Some of his arguments appear, by analogy, equally cogent in the case of linear hypotheses. More explicitly the linear hypothesis does not take into account the important aspect of measurement described as validity, except to describe a lack of it as a biased error or error effect (p. 19). This assumption seems somewhat indefensible since the error effect is described in terms of the measures themselves. We can specify a particular confidence range at any level of significance and yet not have validity. Validity is more than a biased error. Bias and accuracy of measurement logically show some degree of interaction. Knowing the amount of bias will be of no use unless the extent of interaction of the bias with the error of measurement is also known. It is this lack of consideration of the aspect of validity that leads one to question that the Jackson-Ferguson formulation is the final answer.

Hoyt's (39) use of analysis of variance to compute reliability [illegible] also of interest. In Hoyt's method the numerator of his ratio for the determination of the reliability was "among individuals" minus "remainder" mean square. Dividing this by "among individuals" mean square he got reliability, or dividing it by "remainder" mean square he got Jackson's gamma squared. Apparently the difference between reliability (internal consistency) and gamma squared was the difference between two yardsticks—one calibrated in inches, the other in quarter inches.

Other studies which should be cited are: Casanova (5) presented formulas to show the effect, upon the reliability coefficient, of changes in the variables involved in its estimation. Clarke (7) indicated that predictable accuracy in examinations was set by the inconsistencies of performance of the same individual and proposed to quantify the function by his coefficient of "ubiquity." Dressel (18) gave another derivation of the Kuder-Richardson formula, and Mosier (51) used it to derive a formula to simplify its computation.

Remmers (53), in a series of empirical studies, achieved inconclusive results while Ferguson's (22) discussion may be said to represent a rationalization of the problem. Some other empirical studies were reported by Carter (4), Cronbach (12), Drake (17), Froehlich (26), and Guilford (29).

Validity

The fact that test makers and researchers were becoming increasingly aware of the problems of meaning and interpretation of results may serve to add increasing meaning to their results in the future. Weighting and item analysis may be considered as phases of validity since all eventually aim for maximum agreement with the criterion.

Richardson (55) gave a comprehensive discussion of the weighting problem and indicated that the choice of a method of combining variables depended upon the properties which one wished the composite to have. Naturally there could be no single best method to be used in all circumstances. He indicated the properties of several of the commonly used methods of weighting. In this connection mention should be made of Rulon's suggestion (56) for using test scores regressed in terms of their reliability instead of actual scores. Such regression reduces the variability of the test scores and gives a result which is more sensible than raw scores, so long as one works with a single test. If, however, a composite is to be made of several tests one should not weight these regressed scores inversely as their standard deviation (to get *z*-scores), for to do so would be to assign the greatest weight to the least reliable score.

Within this area, as in others, illustrations abound to show that lack of mathematical training among psychologists reflects itself in terms of partial solutions to problems where relatively complete solutions are possible. An example is the study by Forlano and Pintner (25) who used an empirical method to determine the percentage of the total groups which mus[illegible] taken at the extremes of a distribution in order to get maximum differentiation. They found that even for moderately skewed distributions 27 percent seemed satisfactory. An analytical solution of the problem would have specified the exact percents for the various levels of skewness.

Some methods of item analysis which considered only the relation of the item to the criterion were proposed by Daniel (14), Garlough (27), and Guilford (29). Toops (61) gave further discussion of his *L*-method which considers the relation of the items to one another, while Guttman (32) presented an interesting theoretical discussion of the problem.

Psychophysical methods were applied to item selection by Ferguson (23) and Mosier (50) and to scaling by Grossnickle (28).

Thomson (60) followed individual items of an intelligence test over a period of successive retesting, and found that it was not so much the type of item as its difficulty which was of predictive significance.

Scoring

Hartog (34) argued that he had empirically demonstrated a superior educational value and reliability of grading for English compositions written with a given audience in mind than under the usual procedure. Weidemann (62) continued his studies of the essay examination.

Deemer (15) suggested criteria for estimating tolerance limits of scoring errors per paper, when these errors obeyed the Poisson law. Shen (57) contended that the more cautious subjects were unfairly penalized for their omissions on matching tests and proposed a formula to correct the effects of guessing. Colandra (8) in a theoretical discussion used Baye's theorem as the basis of a general equation for scoring objective tests.

The limitations of Baye's theorem and the increased scoring difficulty make the application of little practical importance.

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CHAPTER VIII

Tabulating and Test-Scoring Machines: Applications of International Business Machines to Educational Research

IRVING LORGE

Any review of the literature on applications of machine methods to tabulation, computation, and test scoring at the present time will be incomplete and inadequate. Many applications of machine methods have not yet been given formal publication. The present review will be limited to the machines developed by the International Business Machines Corporation and to applications of those machines to educational research. No single book covers the variety of machines available or the variety of applications possible. It is hoped that the long promised (since 1935) publication on "Questionnaires, Standard Codes, and Hollerith Machines" [illegible] A. Toops will be published soon.

[illegible] IBM machines include a large variety of punches, sorters, accounting machines, auxiliary machines, and special devices. The less well-known machines are the alphabetical interpreter, which prints punched information across a card; the collator which compares two sets of punched cards in order to match them or merge them; the duplicating summary punch; the gang summary punch; the automatic reproducing punch; and the automatic multiplying punch. Some special devices are the cross-footing device which makes possible computations such as $E \pm [(A \times B) + C + D]$; the card cycle total transfer device which enables speedier summation of cumulative sums; the card matching device for selection of specified profiles; the digit selector particularly useful for item analysis; the mark-sensing device which punches data into punch cards from pencil marks; and the test scoring device for grading questionnaires like the Strong Vocational Interest blanks. In addition, the IBM machines include the test scoring machine with its graphic item counter and the aggregate weighting device.

The machines, in general, make for greater speed in recording, classifying, and tabulating data, and in computing statistics. Because of great speed, the availability of data makes for greater statistical control of multivariate background data and extends the possibilities of research reporting.

General Books and Articles

The basic reference in the applications of punched card machines is Baehne (2), which includes chapters on the development and principles of Hollerith machines (Arkin), on applications to work of registrars' offices, and to the work of university business offices, a cogent article on questionnaire construction and analysis (Toops), scoring of the Strong (Strong) and of Free Association tests (Kelley), the use of the multiplying punch (Carver), and the application of progressive digiting to correlation, variance and covariance, least squares, and differencing (Brandt). The Baehne reference is an indispensable background for applications and procedures of the punched card machine.

As an adjunct to Baehne, the various manuals of the International Business Machines Corporation should be utilized (35, 36, 37, 39, 40). Hartkemeier (32) applied the machine to accounting but also illustrated the method of digiting in obtaining correlation coefficients. Eckert (22) indicated the flexibility of the IBM equipment, particularly emphasizing the construction of tables, interpolation, and harmonic analysis. Jolliffe (42) briefly described the machines and their functions in educational research and statistical analyses. McPherson (53) referred to various mathematical operations with punched cards in table making, regressions equations, harmonic analysis, evaluation of determinants, and transformation of data, e.g., scaled scores for raw scores. Meacham (52) developed one of the few teaching texts for use of the machines, particularly in relation to vital statistics.

Carver (7) and Snedecor (72) described the uses of the machines in mathematical computations. Several books give applications to accounting (32, 69) and particularly to school accounting (43). Toops developed an annotated bibliography on tabulating and recording devices, including equipment other than the IBM (82).

Statistical Applications

Since the basic operation of the tabulator is the method of arriving at sums and cumulative sums, an understanding of the summation method of arriving at the values of ΣX, ΣX^2, and so forth, is indispensable. Perhaps the earliest application of the summation method with digiting was made by J. C. Dunlap (12). The earliest references to the use of punched card equipment for correlation and multiple correlation was made by Smith (71).

The digiting method was popularized by several statisticians (5, 76, 87, 88). The summation method was rediscovered (62) and greatly extended by Dwyer (21), who summarized the theoretical background for the computation of moments with cumulative totals and cumulative multipliers. Mendenhall and Warren (58, 88) utilized the principle of cumulative sums and digiting for getting correlation coefficients, giving credit to Leavens for the digiting process (49). Dwyer (18) illustrated the power of the machines to compute the various statistics that are needed from data.

Dwyer and Meacham (20) demonstrated how to prepare correlation tables on the tabulator with digiting by digit selection; Milliman (59) indicated how digiting may be accomplished without sorting; J. W. Dunlap

(13) showed how the machine can compute means, standard deviations, and correlations with positive and negative numbers; DuBois (10) described how various statistical processes can be done on the card counting sorter; Kuder (46) revealed how correlations can be accomplished on the test scoring machine. Dwyer (19) and Meacham (57) employed the collator for pulling prepunched cards with data in form X, X^2, XY, X^2Y, and so forth, to compute moments, product moments, and any tabled function.

Dwyer (17) pointed out that the Hollerith equipment is economical for five or more variables with cases in excess of 250. The Friden, Marchant, and fully automatic Monroe are more economical for four or less variables with cases up to 250.

McPherson (54) gave the background for the mechanical tabulation of polynomials for which the machines had been adapted (89). Sandomire (68) accumulated cubes directly from punched cards and Feinstein and Schwarzschild (26) used the machines for automatic integration of differential equations. Hartkemeier (33) showed how differences may be obtained from punched cards.

In the computation of item validity data, Tucker indicated how to quan-[illegible]ttributes (84a), Royer (66) demonstrated the steps for obtaining [illegible]orrelations, which were somewhat extended by DuBois (11). Stal-[illegible] (73) adapted the tabulating machine for computing difficulty and validity indexes; Flanagan (29) used Kelley's upper and lower 27 percent for getting estimates of biserial correlations and difficulty; Lindquist (50) obtained percents through cumulation of reciprocals for each item choice on a test, a technique also used by J. W. Dunlap (14) for getting basic data for estimating the value of tetrachoric correlation coefficients. Adkins (1) suggested applying the machine for Toope's L-Method of selecting items, and Flanagan (28) for approximating regression equations. The earliest use of the machines for regression equations was perhaps that of Segel (70).

Flanagan (27, 30) adapted Rulon's procedure for estimating reliability coefficients, and Stalnaker (74) noted the computation of Y values for integral values of X.

In factor analysis, Tucker worked out an approximate matrix multiplier (84), a method of getting Thurstone's centroid technique from punched cards (85) and graphs for the factor patterns (86).

Coding and Card Forms

The value of the punched card methods depends upon the classification and coding of the classifications adopted. Research workers will recognize that the coding-classification step is one of the more important elements in analysis. One of the most significant contributions to coding was made by Dunn (16) in his utilization of the geometric code for extending the capacity of a punched card. Toops and Royer extended coding concepts greatly, particularly with reference to the uniqueness of the geometric code (65, 67; 78, 80, 81). Edwards (23) has shown how coding is a necessary antecedent to analysis of medical research data.

Berkson (4) developed an interesting punched card form for written and punched data. The punch operator punches directly from the written data which are always in view on the card being punched. Crissy and Flanagan (9) adapted the punched card for recording status with reference to deciles on various tests so that a profile can be developed.

Statistical Controls

Ever since Toops (77) indicated the need for statistical checks on data, the machine users have attempted to produce automatic or semiautomatic checks on calculations. One of the most significant contributions is that of Langmuir (48) on controlling errors in tabulation, card counts, and calculation. Brandt (6) indicated the effect of coding on calculations and their corrections.

Scoring Methods on Punch Card Machines

In psychology and education, scoring (particularly of multiwei[illegible] items) has been a laborious and time consuming process. Wood's [illegible] (91) for scoring the Strong blank has made work with it and te[illegible] more practical. Bedell (3) achieved somewhat the same result on the card counting sorter, and Rock (63) on the tabulator, particularly for developing item weights for such tests. Toops and his students (41, 79) developed the mask card in scoring multiple choice tests and in securing item analyses. Ross (64) also used the Hollerith for scoring tests.

Test Scoring Machine

The scoring machine implies an adaptation of the test item and the response sheet to the scoring machine (24, 44, 45, 47, 90). The items have to have a specific form and tend to be mostly of the recognition type. Very few investigators, however, have questioned the use of separate answer sheets as compared with direct response in the test booklet. McCullough and Flanagan (51) found the machine scoring form as valid as the booklet type. Traxler and Hilkert (83) noted that students who had plenty of room to take the test booklet with its answer sheet on a table did better than those who had to manipulate the booklet and answer sheet on arm chairs. This finding was statistically significant in only one of seven comparisons, but if proved generally it will imply separate norms for different conditions of administration. Dunlap (15) in an elaborate research has shown that the separate answer sheet does not affect reliability or validity of results.

Statewide and Other Applications

The possibility for accelerating scoring, reporting, and computing with the entire IBM equipment has been realized in many statewide testing programs (38). Some of the many applications and adaptations have not been published. Illustrations of the flexibility of the equipment are given by Feder (25), McQuitty (55, 56), Mosier (60), and Stromberg (75). Cox utilized the equipment for research and student guidance, as do most of the testing installations.

Pinkus (35, 61) adapted the machine for high-school programming in a large urban high school, and Hall and Henderson (31) in evaluating the success of teams in judging cattle and crops.

With the impetus given to speedy test scoring, test reporting, and test analysis by the classification workers in the Army, Navy, and Marine Corps, new adaptations of the machines have been, and will continue to be, made. It is hoped that these applications and procedures will be published for the benefit of research workers in all fields.

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CHAPTER IX

Reporting, Summarizing, and Implementing Educational Research

DOUGLAS E. SCATES

How Should Research Findings Be Publicized?

How can the educational press help in making research effective in classroom practice?" This was the subject discussed by the Educational Press Association of America in its meeting in Atlantic City on February 25, 1941. One speaker, thinking primarily of survey research, fact-finding, and general evaluation, noted the great need for large scale cooperation on the part of field workers and the importance of group action in following up the survey to interpret findings and see that appropriate steps were taken to set the forces of improvement in motion. He urged a greater amount of publicity for such studies before, during, and after their prose[illegible] Another speaker, thinking primarily of "scientific" research—de[illegible]iments, laboratory work, the analysis of causal factors and [illegible]y—noted the slow progress of scientific knowledge, the exploratory character of many investigations, the conflicting results of experiments, and the need for true scientific caution in accepting findings until they had been verified by many studies attacking the problem from a variety of approaches. He urged that due time be allowed between the reporting of a pioneer study and the adoption of practices in the classroom which devolved upon the new findings. Science has often been wrong. Much harm, both to children in the schools and to the esteem with which educational research is held, will inevitably follow upon the hasty acceptance of untested research findings.

There is apparently more than one type of educational research and more than one appropriate type of reporting. Certain undertakings undoubtedly need a broad base of social support; such are the studies which deal with problems that social action can handle. Certain other investigations need careful scientific scrutiny and testing over a period of years before they are ready to be thrust upon large groups with the admonition to accept them, for they are "scientifically proved." Such studies need to be reported in technical journals which will excite the interest of other workers competent to study them further. In due time they will be ready for inclusion in yearbooks, textbooks, and teachers' magazines. If science is not to mislead, it must be science—and not the results of some one or several studies made by workers having the same background of ideas. No finding is safe until it has been critically examined and tested by workers with diverse points of view. Our efforts to have research reported more widely and immediately should therefore be discriminating.

Need for Synthesis, Interpretation, and Evaluation of Research

It may be that there are certain deficiencies in the existing provisions for research investigations and reporting which retard progress both in practice and in theory. Reports of research findings need to go through a number of steps before they are ready for ultimate use. Our division of work in the United States may possibly be weak in some one or another of these points along the line. Possibly more facilities for reviewing, interpreting, synthesizing, and evaluating are needed. There is always danger that with various schools of thought and individual research centers pursuing their own special problems, no one will do the necessary work of synthesizing the various findings and weaving them into a "nonpartisan" whole which will have meaning and value for the consumer of research. In building our knowledge, the facts that add perspective are as important as the facts that add detail.

Such an integrating, evaluating task is entirely different from the direct dissemination of results of individual studies. We undoubtedly need, in education and psychology, more "research philosophers" who are not primarily engaged in producing research themselves but who will assem[illegible] relate, and find both theoretical and practical meanings in the grea[illegible] of research which is completed every year. The conclusions of [illegible] preters would differ, but there is no reason for assuming tha[illegible] based on existing research, would be any more in error than are many of the individual research studies. Such a process was one of the goals of Walter S. Monroe in preparing his *Encyclopedia of Educational Research* (52), when he urged each writer to tell, "What does the research to date add up to?" This function is discharged to a certain extent by the REVIEW OF EDUCATIONAL RESEARCH, though most contributors lean in the direction of being comprehensive and noncommittal rather than in the direction of interpreting, evaluating, and synthesizing.

Need for Direct Study of Applications

We also need persons who view research findings from a background that is charged somewhat more with the needs of the practitioner than with the abstractly technical and scientific considerations of the research producers. Such work can often be effectively accomplished by committees, if the persons with different backgrounds are willing to make some concessions to the criteria of those who have opposing frames of reference. At any rate, all must recognize that when research is to be applied, some of its "purity" must be given up—at least for the time. The attempt to apply will, however, lead to new problems demanding further study. Any application of science calls for a continuing adjustment between various factors, as one after another is modified or as general goals and purposes change.

We may, for example, note this sequence of study—application—study, in the case of radio. Although radio is based on the fundamental principles of electromagnetic wave propagation set forth in mathematical terms by James Clerk Maxwell some seventy years ago, radio did not immediately spring into existence. Research on radio tubes is still under way, and it appears from the current full-page advertisements of the General Electric Company concerning its developments in electronics that a new area of possibilities has just been uncovered. And of course radio research must deal not only with tubes but with all aspects of radio—combinations of tubes, improvement of parts of the circuit, groupings of parts into new circuits, sound, adaptations to various purposes, market research, and so forth. It is probable that research on radio, both on the physical side and on the market side, will continue indefinitely. Even though radio as we think of it lies in the field of technology, the great number of problems which arise in the applications of the various scientific principles reveal countless lines for "pure" research to follow up—lines that would otherwise never be dreamed of. We would have no science of electronics if we had not first had the radio tube. Pure science, when it is alert, profits from applications as much as does the consumer. The same condition holds for research in education. The problems of application are as great as the problems of original discovery—and are in the long run as stimulating [illegible] "pure" research.

[illegible]lly just the change from small-scale to large-scale procedures [illegible] new difficulties. This condition is well illustrated in medical chemistry by the early work with insulin. After the hormone had been discovered, had been experimented with both in the laboratory and in the clinic with highly satisfactory results, its manufacture on a large scale was undertaken. The results "were at first extremely unsatisfactory and disappointing. Indeed, for some months (in 1922), although every stage of the laboratory process was apparently being duplicated step by step on the larger scale, it seemed impossible to obtain anything like the expected yield of insulin. It almost looked as if we had lost the secret of preparing insulin. Some unknown factor had evidently crept in, leading to the destruction of the hormone during its large scale extraction. . . . It was several months before the difficulties were gradually overcome. . . . It has since transpired that a chief cause for the difficulty depended on inadequate control of the degree of acidity at certain stages in the extractive process."[1] The transfer of science from the laboratory to large-scale use may be expected always to have attendant problems requiring further study and research.

Examples of Research Summarization, Synthesis, and Interpretation

The joint yearbook of the Research Association and the Department of Classroom Teachers (3) is a recent illustration of the summarization and interpretation of research findings for direct classroom use. It is the current counterpart of the Eighteenth Yearbook of the National Society for the Study of Education, Part II, presenting the Fourth Report of the Committee on Economy of Time in Education, issued in 1919. Such reports are pointed toward the practitioner.

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[1] J. J. R. Macleod. "Insulin to the Rescue of the Diabetic." In *Chemistry in Medicine*, Julius Stieglitz, ed. New York: The Chemical Foundation, Inc., 1928. p. 304-305.

The *Encyclopedia of Educational Research* (52) was an effort to present "comprehensive and critical syntheses of the results of educational research organized in a conveniently usable form. . . . It is the purpose to tell what the findings of research 'add up to' after critical evaluation and what this synthesis of findings means relative to educational theory and practice" (p. vii). The *Encyclopedia* stands about midway between the original research reports and the interests of the ultimate consumer of research. It is of service to both groups of users.

In the general category of interpretative summaries of research should be mentioned the five-volume report now being published by the Progressive Education Association (64) covering the Eight-Year Study of high-school and college articulation, and the final volume of the American Youth Commission (6) summing up their several years of study. Other aspects of interpretation, involved directly in implementation [illegible] be discussed toward the close of the chapter.

The 1938 Contributor's Manual for the REVIEW OF EDUCA[illegible] SEARCH states that "The REVIEW is to be factual, evaluati[illegible] gestive." A chapter should include "A summary description of the methods, . . setting or background, placing the research properly in its field, . . critical evaluation indicating weaknesses and strengths, . . a general overview of the field indicating the contribution of the research to practical problems and to a developing generalization." The 1942 edition states: "The purpose of the REVIEW OF EDUCATIONAL RESEARCH is to review—summarize, synthesize, interpret, and evaluate—current research in education." As indicated previously, many contributors to the REVIEW lean more toward a catalog of current research than a synthesis. The significance of research for practice is seldom pointed out; probably the REVIEW is too close to the original reports for this to be an appropriate step. The REVIEW is of primary service to students or others about to undertake a piece of research in a field that is somewhat new to them, and to those who wish to keep abreast of research activities in a variety of fields in education.

It will be noted from looking over interpretative syntheses that they almost necessarily involve going beyond the data and drawing more general or more particular conclusions than the facts will entirely support. The more the summaries attempt to interpret research for practice, and the further away they get from the original reports, the more this is true. Such a step is not to be shunned. It is one phase of "applied science"—technology. Science itself deals usually with single, narrow aspects of phenomena; the practitioner needs to consider all the aspects of the situation in which he is working. Such practical interpretations of research are, therefore, to be regarded as approximations and, perhaps, as starting points for further study, when the results in the field do not approximate those obtained in the more theoretical work. By way of analogy, it is easy for physicians to destroy viruses in the laboratory, but they have practically given up the attempt to stop or control a cold in one's head through the use of antiseptics. "In this case general therapy is more effective than local therapy," one is likely to be told. All syntheses of theoretical findings must be regarded as highly tentative for practice; the application usually involves difficulties which require that the theoretical conclusions be restudied in the light of practical factors.

Overviews and Compilations; Bibliographical Summarization

There are a number of summaries which present overviews of certain research areas or periods, usually with some interpretation but without a definite attempt to synthesize into a general theory or point of view the findings of the research reviewed. Outstanding among these are the annual reviews of large research undertakings and implementing projects by Good (32) which have been published for the past five years. Good also prepared a somewhat longer résumé and orienting discussion (33). Scates [illegible] prepared a brief overview of research for the past decade. Carr has [illegible] the seventh listing of Deliberative Committee Reports (20); [illegible] to the earlier annual compilations are included. These lists are annotated and help give an annual picture of the findings and decisions of various committees that are working with educational problems.

If we include those publications which merely select, classify, and make more available the original articles, we should mention such periodicals as *Education Abstracts*, *Education Digest*, and the *Loyola Educational Digest*. There is also the work of the National Education Association Research Service in publishing *Education in Lay Magazines*. This periodical was recently analyzed for a ten-year period by Hughes (43). A section of the *Journal of Educational Research*, "Research News and Communications," edited by C. V. Good, is given over each month to the publishing of news notes about current research activities. Purely bibliographical services were treated in Chapter I of the present REVIEW.

Procedures and Criteria for Preparing Technical Reports

This section deals with the more immediate or detailed aspects of reports. Treatises on the preparation of research reports before 1936 were covered by Good, Barr, and Scates (35: Chapter 13) with 126 references, and by Culver (26) with 62 references. Whitney's 1937 text or his revised edition (90: Chapter 16) includes about 50 references. Nine more or less brief treatments on the preparation of theses or undergraduate research papers are: (19, 23a, 24, 34, 36, 44, 61, 86, 94). Several papers on desirable forms in which to report statistical facts to businessmen, news reporters, and other consumers (11, 29, 45, 96) grew out of a program of the American Statistical Association on this subject. One may wish to consult publications on the preparation of research reports in engineering (8, 42) and in chemistry (56, 69).

Various forms of citation for use in educational work are included in the educational treatises of the preceding paragraph. Forms of citation for psychological publications were discussed in three places (30, 46a, 83). A revised edition of the Government *Style Manual* (87) has appeared. The University of Chicago *Manual of Style* (23) has gone thru its tenth edition. Manuals for contributors to the REVIEW OF EDUCATIONAL RESEARCH were issued in mimeographed form in 1938 and in 1942. Other publishers have prepared form books and manuals for their own authors. For current listings see the head, "Stylebooks (printing)" in the *Education Index.*

Segel, in Chapter III of this issue, notes the need for specifying conditions and units of enumeration; and Blommers and Lindquist, in the closing section of Chapter IV, mention the need for clearer and more adequate descriptions of the technical aspects of what was done, in reporting any investigation.

Popularized reports and graphing are discussed in later sections. For current references on reporting, one may see the head "Reports: Preparation" in the card catalog of a library; Good's "Selective Bibliography [illegible] Methodology of Educational, Psychological, and Social Research," [illegible] III—usually in the September issue of the *Journal of Ed*[illegible] *search;* and "Research, Educational: Techniques" in the [illegible] Education annual *Bibliography of Research Studies in Education.*

Evaluation of Reporting Mediums; Problems of Publishing

Various statistical attempts have been made to estimate the service which a particular magazine is rendering. Circulation is one basis for estimating service and appeal. The number of persons who read each magazine is a second index (35:126-30). The number of times articles in a magazine are cited in articles appearing in other professional magazines is a third form of evidence concerning worth. Direct judgments or evaluations constitute a fourth method. An analysis of the third type was made of several psychological periodicals some time ago by Cason and Lubotsky (21) and has been done more recently for educational periodicals by Wilkins and Anderson (91, 92, 93). As is the case in all evaluations based on frequency studies, considerable care must be exercised in drawing conclusions. Similarity or commonness of interest and purpose between the periodicals cited and those doing the citing and between the citing periodicals and the reader must be assumed before such frequency counts have significance either in general or for the prospective reader or subscriber. Steele (81) prepared a rating scale for book reviews and applied it to certain journals.

Publication lag was discussed in two places (66, 67) in psychological magazines and was discussed in educational magazines by Donohue (28). Microphotography or microprint as a method of publishing research was treated in Chapter I.

Dull vs. Appealing Reports of Activities

In recent years there has been something of a revolution in the public reports of the activities and statuses of school system and corporations. If reports are worth making, they are worth reading; if they are to be read, they must have widespread appeal. So superintendents, business managers, municipal governors, and industrial corporations have concluded that if their reports to the public or to stockholders are dull or not instantly comprehensible, it is the fault of the persons who get the report out, for reports can be glamorous! Accordingly, many reports have been made much more appealing, usually thru the use of more photographic or other graphic material, and through the decrease of tables and routine records of departmental work. The older reports were commonly couched in technical or semitechnical terms and involved matters of far more concern to the persons in charge than to the common reader.

While we are not here intimately concerned with superintendents' reports, inasmuch as they cover activities and seldom deal with research, [illegible] may nevertheless have occasion to consider some of the methods they [illegible] employed. There are times when research could well afford to stimu[illegible]cy and interest of lay people in its endeavors, its problems, [illegible] ingenuity and patience of its workers, even though it makes no effort to acquaint people with its detailed findings. Numerous current popular reports of medicine and physical science do a great deal to keep these fields in high esteem in the public mind. Educational research, like school administration, is in need of taking time occasionally to glorify its work and share with others the hopes that impel its workers forward in their long, monotonous tasks and the difficulties and discouragements that often beset the explorer seeking something which, even after years of effort, he is not sure is there.

The changed character and purpose of many superintendents' and business managers' reports were reviewed at some length and with considerable clarity by Theisen (84). Arnold and Castetter (7) mentioned three more articles. Educational Research Service prepared a bibliography (2) on superintendents' reports. We shall make reference here only to six articles commenting on the character and preparation of such reports (10, 16, 27, 46, 62, 72).

It seems appropriate to mention as examples four recent school reports which are conspicuous among those which are highly pictorial: (a) The Springfield, Missouri, 1938 report (80) carried about 60 percent pictures and no tables, and was published "to give you as taxpayers some notion of our conception of the meaning of democracy and its importance, and some idea as to the school's responsibility for and contribution to preserving and making democracy work better." (b) The Rochester, New York, 1943 budget (71) carries six pages of pictures, captions, and paragraphs at the outset, and the budget is presented in the remaining twelve pages with a moderate amount of text and about 20 percent pictures. Graphs are pictorialized in various ways. The Rochester budget for some years has been an inspiring publication. Its present character took form in 1936; its earlier popular form dates back to 1927. (c) The Fostoria, Ohio, report for 1941 (31) carried about 90 percent pictures. Three pages were "thermometers," showing the ratings of the schools on eighteen aspects according to the Cooperative Study of Secondary School Standards. It is interesting as a report of a relatively small city. (d) The Chicago report for 1941 (22) was profusely illustrated (about 30 percent of space) thru some 500 pages, followed by about fifty pages of tables. (The report covers the years 1936-41.) It was organized around activities in the school curriculum which were of immediate interest to parents and the general public. (e) In addition to these reports for individual cities we should mention a popular report of the U. S. Office of Education (88) which utilized pictorial and diagrammatic material to portray its manifold activities. There was no separate text.

As treatises on the preparation of reports in business and city gove[illegible]ment, five references will be cited (8, 70, 75, 77, 78). Other refe[illegible] may be found in the card catalog of libraries under "Reports: P[illegible] tion" or "School Reports"; in the *Education Index* under "[illegible]als, Re[illegible] Records"; and in the U. S. Office of Education annual *Bibli*[illegible] *Research Studies in Education* under "School Management: Reports and Records."

Visualized Presentations of Research Findings

While the reports of activity and status referred to in the preceding section relied largely upon photographs, because of their appeal and portrayal value, reports presenting research results, survey findings, and summarized data have made more use of one form or another of graphs. Thus the Regents' Inquiry of New York State summarized the results of "fifteen printed volumes and many typewritten and mimeographed reports" in a 46-page *Primer* (39), consisting of one or two sentences of text on each page with a pictograph occupying the rest of the space. In the same year the New York State Education Department published a bulletin (60), consisting of thirty-six full-page pictographs with a short paragraph of text accompanying each, to present a brief history of the schools of the state and their problems. The American Youth Commission's *Youth Tell Their Story* (9) contained sixty-two charts and pictographs—one diagram for every 3½ pages of text—in addition to ninety-nine tables. Shuttleworth's presentation of factual material on growth during adolescence (79) depended wholly on graphs and pictures, with accompanying paragraphs of explanation; there was no separate text. Goodykoontz departed from the traditional style of the U. S. Office of Education summary bulletins (37) by omitting ordinary tables and diagrams and introducing a number of pictorialized graphs.

Other Visualized Factual Material for the Nontechnical Consumer

We shall refer here briefly to several other publications which are good examples of the technique of presentation being discussed. The War Department innovation in a textbook (89) which is devoid of text apart from brief comments on the graphs is interesting both because of its subjectmatter and its form. A graphic history of the United States (40) has about one-third of its space given over to an ingenious variety of pictographs. The magazine *Building America*, published by the Americana Corporation for the Society for Curriculum Study and now in its eighth volume, gives roughly 40 percent of its space to text and 60 percent to pictures and graphs. The set of pamphlets published each year by the Travelers Insurance Company (Hartford, Connecticut) on automobile accidents, for free distribution to schools, and the annual publication *Accident Facts* (55) are excellent examples of how simple, "dry" statistics can be made most attractive. Hoban, Hoban, and Zisman (41: 198-207) not only discussed visualized textbooks but prepared a treatise on visual materials for classroom use which may itself be cited as an example of visualized text. [illegible] Public Affairs Pamphlets (distributed to schools by Silver Burdett) [illegible] Headline Books of the Foreign Policy Association are active series [illegible] extensive use of pictographs.

Neurath's semipopular treatise on modern man (59) included many pictorial diagrams which he states "do not merely act as illustrations or as eye-bait; they are parts of the explanations themselves" (p. 7). As other examples of books in which the visual material is integrated with the text and forms a part of the continuity, instead of serving merely as exhibits, we may mention two books by Caldwell and Bourke-White (17, 18) which represent photographic and verbal reporting of American life. A publisher's blurb states: "Two creative artists have developed and mastered an original and brilliant pattern of book-making. The face of a nation has never before been recorded so richly as here."

An Outstanding Graphic Development: Pictographs

One cannot read the references in the two foregoing sections without realizing that a new type of graph has come to occupy a leading position among graphs designed for popular consumption. This newcomer is the pictograph. It not only does an admirable job of presenting comparative quantities but, in the capable hands of its leading exponents, it has been adapted to clarifying and presenting complex relationships, including cause and effect and story sequences. In spite of doubts and inhospitality which have been prevalent among technical workers during the past two decades, this type of graph has swept into indisputable dominance of the graphic field wherever relatively popular reports of a few quantities are involved.

The pictograph is essentially a series of suggestive symbols repeated to form pictorial bars. There are other developments of pictograph, in the realm of maps and sequences, which involve primarily simplification and suggestion. The pictograph is not appropriate where curves are called for; but frequently the popular graph can, and should, be simplified to the point where a few values will suffice in place of the larger number of observations giving rise to a smooth curve. At a meeting of the American Statistical Association in Chicago (December 28, 1940) devoted to "Principles and Procedures for Putting Across Business-Statistics Reports to Executives," several speakers and other commentators expressed dislike and disdain for the pictograph. It was regarded as a highly complicated and frilled device which commonly ends in fractions of a symbol and generally distracts one's attention from the main point. Brinton (12: 12-13), in his preface, implies that it was developed in countries where the people had a low level of literacy and is something of a "weed" in America. It seems probable that the professional statistician, thinking only of a technical or intrinsically interested reader, will view such graphs differently from what the general reader will. Pictographs, where they are well designed, catch one's attention, getting many a reader to pause long enough to look at the graph. They hold the attention on each bar, or category, longer than a simple printed label would, thus giving time for more comprehens[illegible] They add an emotional element of interest, enjoyment, and satisfa[illegible] to the bare facts which are presented. And, again when they are [illegible] they represent a careful analysis of the problem and a simplifi[illegible] the most important aspects so that the main points stand out clearly—which is just what a graph should do. If they go further in this direction than the highly trained statistician would go, perhaps the statistician needs more training along the line of how the common person thinks.

The pictograph was developed in a social science museum in Vienna during the early 'twenties, principally under the sponsorship of Otto Neurath, with Rudolf Modley as a member of the staff. While earlier isolated instances of this type of graph were produced or quoted in several textbooks (1; 12: 122-24; 73; 74), in the United States nothing was done to exploit its possibilities. Modley came to America in 1939, joining the staff of the Chicago Museum of Science and Industry. In 1934 he helped found, and became executive director of Pictorial Statistics. This agency, which renders a commercial service to schools, authors, and publishers, has lately used the name of Pictograph Corporation because its work has extended to include nonstatistical graphing. Neurath left Vienna in 1934 and helped establish the International Foundation for Visual Education at The Hague, Holland. He is now at Oxford, England.

The movement which developed the pictograph has involved far more than just drawing graphs; it has embodied the searching for social facts and relations which are of importance to present. It has lead to social museums, foundations, and a great increase of interest in social statistics. The history of the movement to 1937 was presented by Modley (47: Chapter 13).

Examples of pictographs are far too numerous to mention here. Many of the reports cited in previous sections employ them (9, 39, 40, 59, 60, 89, and others). Modley (47: 158-66) gives an extensive bibliography for publications in Europe and in the United States to 1937.

Treatises on the Production and Use of Pictographs and Other Graphs

The principal discussion of pictographs and methods of making them is by Modley (47) in 1937, a work which is now being revised. His best brief discussion of types of pictograph to portray various facts (51) is probably not widely available. Other discussions, however, serve to round out the picture (41: 242-47, 48, 49, 50, 95). Three of these references (41, 48, 50) deal particularly with the use of pictographs and other charts for teaching purposes in the classroom. A catalog of *1000 Pictorial Symbols* (63) has been published illustrating pictograph symbols which are available for use by others (cost, 5 cents each, to schools). Two small books by Neurath (57, 58) discuss the use of pictographs for an international symbolic language.

A point that is likely to be overlooked by the novice and omitted in the un[illegible]ises is that the success of a pictograph depends upon something more [illegible]er symbols. The production of a good graph involves, first, an [illegible] the principal facts or elements of the story to be represented; second, the selection of the appropriate type of graph; third, judgment as to proportion, titles, legends, and so forth, so that the final product is a graph that is simple, clear, bold, engaging, and accurate in the impression it conveys. A successful graph depends far more on careful thought and judgment than on technique.

This section is not concerned with graphing in general but only with graphs which are particularly important in the reporting of research and summarized facts. In this connection we note two publications of basic importance (4, 5) by committees of the American Society of Mechanical Engineers. These reports (one of which is in press at the present writing) represent a long-delayed answer to hopes which were engendered some twenty-eight years ago when a committee was set up to produce standards for graphic presentation. The preliminary report, published in August 1915, was reproduced in many textbooks, but was generally regarded as something of a makeshift. It is therefore a great satisfaction to have extensive, detailed, and authoritative reports covering two large groups of graphs—time-series charts, and engineering and scientific graphs. Brinton's pioneer treatise on graphic methods (in 1914) has been superseded by a revised edition (12) which, though it lacks the adequate textual setting of the earlier volume, presents a great variety of graphic possibilities. One further reference (68) may be of interest since it reveals statistical graphs from the point of view of a cartographer. Other treatises will be found by consulting the head "Graphic Methods" in the card catalog of a library or in the *Education Index*.

Implementing Programs and Publications

A brief note on implementation will close this chapter on reporting and also finish this research volume which was appropriately begun with a discussion of library procedures. Getting research into practice completes the research cycle—and also begins a new one, for further research will have to be done on how well a device or procedure works in practice and how to improve its functioning in practice.

According to the new *Webster's Dictionary of Synonyms,* published this fall, the verb "implement" "has seen rapid development in its implications . . . especially since early in the third decade of the twentieth century"—which was about the time it greeted our ears on every hand in educational conventions and deliberative committee meetings. The word "usually" suggests reference to . . . proposals or projects which have been accepted, policies which have been adopted, and the like, and implies the performance of acts that definitely carry them into effect or ensure their being put into operation."

In a sense, every educational organization in the country is engaged in implementing its program, and so far as this deals with educational research, it is deserving of recognition here. We must therefore content [illegible] selves by referring to a few outstanding examples of what is goin[illegible] somewhat widely. The Implementation Commission of the Nati[illegible] ciation of Secondary-School Principals has been at work for seve[illegible] stimulating publications which help translate general principles into terms of definite school action. The Discussion Group Project, begun in 1937, is another outcome of the work of this Commission. The Cooperative Study in General Education and the Commission on Teacher Education, both of the American Council on Education, and the Stanford Social Education Investigation are other examples of implementing work—concerned with carrying significant facts and research findings to the cooperating institutions and developing applications.

The Progressive Education Association Commission on the Secondary School Curriculum published, through various subjectmatter committees, a number of implementing treatises. Reference to one of these volumes will serve as an example. The treatise on science (65) not only details the general program but contains a chapter on "How the Teacher May Make Use of the Report" and gives several extended illustrations of science units. Reports of the National Committee on Science Teaching of the American Council of Science Teachers helped further to implement general policies in this same area. A recent series of publications by the U. S. Office of Education represent an implementation of our general policy of teaching democracy and the fundamental issues of the war in the public schools. The new series of pamphlets on problems in American life (54) is instructional material to implement a belief that contemporary problems should be taught in the high school. The joint yearbook of the American Educational Research Association and the Department of Classroom

Teachers (3) is an example of attempting to implement all educational research which bears directly on teaching. Further details and other examples of implementation will be found in the general summaries of research activities by Carr (20), Good (32, 33), and Scates (76), cited earlier, and in Good's section, "Research News and Communications," appearing monthly in the *Journal of Educational Research*. A committee of the American Council on Education outlined implementing practices and principles (2a, 38a).

Summary Statement

A number of writers have commented on the general relation of research and classroom practice (3, 13, 14, 15, 25, 38, 53, 82, 85). Some are impatient that research findings are not more quickly and more generally introduced into the classroom. Some think the difficulty lies in inadequate and improper reporting of research. The basic attitude seems to be, "What is worth knowing is worth putting into practice." The difficulty is that we do not know something as quickly as we are likely to think we do. What the teacher or administrator may regard as proved beyond question, the more cautious research worker may regard as only in the beginning stages [illegible] exploration. It is certain that we shall do both research and educational [illegible] an injury if we take the attitude that the findings of every study [illegible] once be made available for putting into practice. Much of our research is for science rather than for practice, and all research needs mellowing. The best course for getting research into practice is not through more widespread and direct reporting of findings to teachers and administrators but rather thru more deliberative and implementing committees which will carefully weigh results in a broad field of study, synthesize the findings into consistent theories, express principles in concrete terms, adapt generalizations to local conditions, try out recommendations, and then offer conclusions for general action by workers in the schools. Local committees of teachers and administrators who have some research perspective and who understand that the applications of "raw" findings involve further study and research, can often help in the process, especially when they work in cooperation with a university professor who understands both research and teaching. Such procedures take time, yes, but they represent the only safe course for both the schools and research.

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† Elected to membership beginning January 1, 1943.

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